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OFFICIAL JOURNAL OF THE AMERICAN COLLEGE OF SURGEONS

ANNUAL SUBSCRIPTION: UNITED STATES AND CANADA, $12.00; FOREIGN, $14.00

Volume XXXIII JULY, 1921 Number 1

Surgery, Gynecology and Obstetrics

WITH

International Abstract of Surgery

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Entered as second-class matter May 22, 1913, at the postoffice at Chicago, Ill., under the Act of Congress, March 3, 1879.
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SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE PUBLISHED MONTHLY

VOLUME XXXIII JULY, 1921 NUMBER 1

HABITUAL OR RECURRENT DISLOCATION OF THE SHOULDER[1]

BY M. S. HENDERSON, M.D., F.A.C.S., ROCHESTER, MINNESOTA
Chief of Section on Orthopedic Surgery, Mayo Clinic

THE literature on the subject of habitual dislocation of the shoulder is characterized by the absence of definite reports on end-results. This communication is primarily a report of nineteen patients operated on in the section on orthopedics of the Mayo Clinic for recurrent dislocation of the shoulder. Twenty-six patients have been observed, twenty-three before January 1, 1920.

That dislocation of the shoulder is not more common demonstrates how wonderful are mechanism and muscle balance that prevent such an occurrence; this is all the more remarkable when one considers the poor bony formation of the joint from the view-point of mechanics.

Almost invariably there is a severe injury at the time of the primary dislocation followed by a normal convalescence, but the second and subsequent dislocations usually are not accompanied by any trauma or severe muscle strain. There is no way of finding out what percentage of persons who have had dislocations of the shoulder become sufferers from habitual dislocations. If there is any way of preventing recurrence of the dislocations the means should be known and used. Following the primary dislocation the arm should be held to the side for 3 weeks and no abduction permitted for at least 5 weeks. Some stiffness may result, but this can be overcome by massage and use, or if necessary, by manipulation under an anæsthetic.

The movements producing habitual dislocations are abduction and a slightly forward motion, the arm being in the position assumed when a person reaches for something on a shelf slightly above the level of the shoulder. I am convinced that some altered muscle tension has to do with the production of the dislocation. This lack of muscle tone may be caused by an alteration in the relationship of a muscle to its original insertion; for example, it has been claimed by many that the relationship of the supraspinatus and the infraspinatus to their insertion is altered by their being partially torn off at the time of the original injury. It may then be assumed that at least a part of their supporting action is lost because of a lengthening of their tendinous insertion. Lovett has drawn attention to the fact that he has noted an abnormally large space between the head of the humerus and the acromion process and that the shoulder is apparently lower, and he has inferred from this that the shoulder capsule was relaxed. In only two cases, one a patient with a posterior dislocation and the other an epileptic, have I been able to produce a dislocation when the patient was on the operating table anæsthetized and thoroughly relaxed. It is probable that in others by vigorous manipulation I might have thrown the shoulder out, but it must be remembered that recurring dislocations are not produced by violent trauma. My efforts, however, were quite

[1]Presented before the Western Surgical Association, Los Angeles, California, December, 1920.

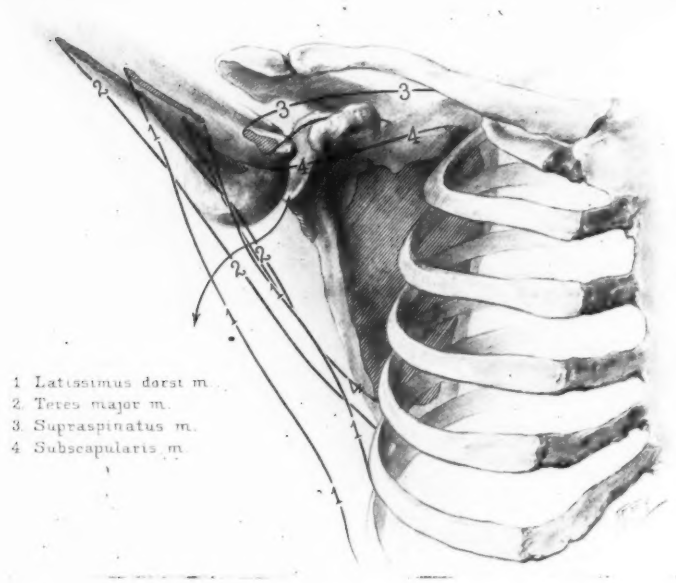

Fig. 1. Anterior view of shoulder-joint with origin and attachment of muscles concerned in the dislocation.

sufficient to convince me that the dislocations seldom are due to any primary fault in the structure of the head or the glenoid fossa, but that they are produced by the action of certain muscles whereby the head of the bone is thrust against a weakened portion of the capsule. No doubt structural changes are found in persons who have had a great many dislocations, as in epileptics, but I believe the changes in such instances are the result and not the cause of the dislocations. In a previous paper on this subject I have more fully considered the anatomical structures of the shoulder-joint (7). Thomas, Rivière, Clairmont, Eden, Finsterer, Joseph, Ricard, Gerster, Young, Burrell and Lovett, and others have written excellent articles on habitual or recurrent dislocation of the shoulder.

The factors essential to the easy recurrence of a dislocation I believe, are these: The primary dislocation causes a tear in the anterior inferior portion of the capsule, which is the weakest and most lax region. This area is not supported by the tendinous insertion of muscles since the subscapularis is above and the new fibers of the triceps that have their origin from the glenoid margin are below. The supraspinatus and infraspinatus tendons may be torn at the first luxation and as true tendon is always replaced by scar tissue the repaired tendons may stretch. The insertion of these muscles may actually be torn off, resulting in relaxation and loss of tone of the muscles which permit the head of the bone to drop a trifle lower than its normal position. In not a few cases of fresh dislocations which I have seen the greater tuberosity was torn off. When the arm is in the position in which most of the dislocations occur, namely, abduction above the level of the glenoid fossa and slightly forward, the condition of the muscles and the direction of their pull are as follows:

The supraspinatus and infraspinatus have not their normal tension and thus allow the head of the bone to be a little lower than normal. The teres major, the latissimus dorsi, and the pectoralis major tend to pull the head into the glenoid fossa, but they also tend to pull the head downward and forward. The supporting action of the subscapularis is

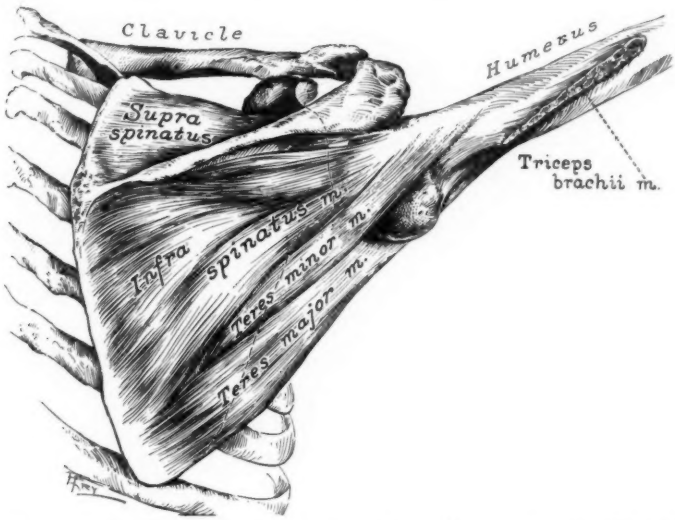

Fig. 2. Positions of muscles on posterior surface of scapula. Capsule of joints is not shown.

gone because the slightly abnormal low position of the head of the bone puts the muscle across the upper half of the head of the bone leaving the lower half unsupported. The head is thus thrust against the weak place in the capsule below the subscapularis and as the powerful latissimus dorsi, teres major, and pectoralis major contract, the head slips over the edge of the glenoid margin, bulges out the capsule, and glides up, usually to form a subcoracoid dislocation (Figs. 1 and 2).

In the group of 23 cases the average age of the patient was 28 years; 20 were males and 3 were females. The dislocations were equally divided on the right and left sides. Trauma was mentioned as the initial cause in all. Two patients were epileptics. Nineteen patients were operated on; three of the operations, however, are too recent to be of great value in estimating results. In the 16 cases, however, we may reasonably discuss the results attained by surgery.

Capsulorrhaphy was the type of operation used to prevent the dislocations (Fig. 3). The weak point in the capsule is the anterior inferior portion, and this must be strengthened. The manner of approach is immaterial. We have used an incision along the axillary anterior border, carefully avoiding, on deeper dissection, the circumflex vessels and nerves. Besides the capsulorrhaphy in a certain number of cases we have lengthened the pectoralis major, a procedure that has been advocated by Young, because we believed that this muscle had something to do in the production of the luxation.

I have classified as cures only those cases in which there have been no recurrences. One group is in reality worthy of being classified as decidedly improved and another as improved, since fewer dislocations occurred than before operation and the patients are well satisfied. Some operations are clearly failures; the condition is as bad and perhaps worse than before operation. In some instances this is undoubtedly due to faulty operative technique as occasionally the approach to the capsule of the joint is difficult, and the field discolored with blood, particularly in muscular persons.

From the group of 8 cases which I reported in 1917 (7), 2 patients (Cases 3 and 4) report that they have had dislocations, the former 6 years and 11 months after operation, and the latter 5 years and 8 months after. They are both, however, decidedly better than they

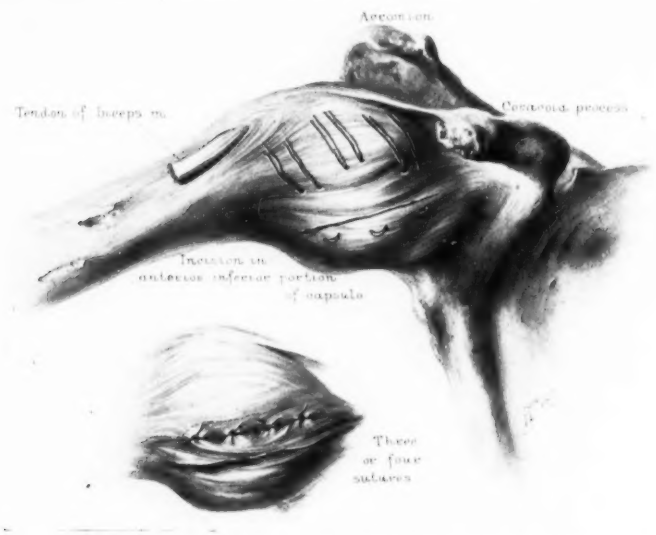

Fig. 3. Capsulorrhaphy overlapping with four doubled chromic catgut sutures. The principle of the Mayo repair of abdominal hernia is followed in this operation.

were before operation. These cases illustrate the difficulty of determining whether or not a patient is to remain free of his luxations.

In Table I the percentages of cures, and the percentages of improvement in the 16 cases, are tabulated, showing on the whole very satisfactory results. It is quite probable that our cures in this series will in time be reduced for all cases operated on one year or more have been included. Table II shows the percentages in cases in which operations have been done more than 3 years (Tables I and II).

REPORT OF CASES

CASE 1 (66183). Mr. W. C., a laborer, age 24, came to the Clinic for examination April, 1912. Six years previously he had dislocated his shoulder, and the dislocation had not been reduced for 36 hours. After that there had been multiple dislocations, not prevented by apparatus. Capsulorrhaphy was performed April, 1912, and there were no dislocations until November, 1913. January, 1914, the Young operation was performed. The man has since had dislocations, and the case must be called a failure.

CASE 2 (87419). Mr. H. W., a laborer, age 25, came for examination July, 1913. Five years before his left shoulder had been dislocated in a runaway accident. Later he had had seven dislocations and was incapacitated for a month after each. There had been an interval of 2 years between the last two dislocations, the latest one occurring in June, 1913. Capsulorrhaphy was performed July, 1913, and in a communication from the patient, August, 1917, he stated that he had had no further trouble and was doing everything he wished to do with his arm. In a letter, October, 1920, he states that the arm is normal. This patient evidently is cured.

CASE 3 (90312). Mr. L. L., a clerk, age 19, was first examined at the Clinic, August, 1913. Eighteen months previously the shoulder had been dislocated while he was playing hockey. During the 18 months

TABLE I.—HABITUAL DISLOCATION OF THE SHOULDER

		Per cent
Patients observed	23	.....
Patients operated on	19	.....
Patients operated on previous to January 1, 1920	16	.....
Patients concerning whom information has been received	16	.....
Patients cured	8	50
Patients decidedly improved	5	31.25
Patients cured and decidedly improved	13	81.25
Patients on whom operation failed	3	18.75

TABLE II.—PATIENTS OPERATED ON MORE THAN THREE YEARS

	8	.....
Patients cured	3	37.5
Patients decidedly improved	4	50
Patients cured and decidedly improved	7	87.5
Patients on whom operation failed	1	12.5

Two patients had one dislocation 6 years, 11 months, and 5 years, 8 months, respectively, after operation.

the dislocation occurred probably a dozen times, the last time while he was swimming. Capsulorrhaphy was performed August, 1913. The patient's mother in a communication, September, 1917, stated that the arm felt somewhat weak, but that no dislocations had occurred. In July, 1920, 6 years and 11 months after operation, the patient dove, with his arms in the usual position. The shoulder dislocated on striking the water. This is the only dislocation since the operation. We may safely class this patient as decidedly improved.

Case 4 (107485). Mr. M. G., a merchant, age 41, was examined June, 1914. Nineteen years before he had fallen and dislocated his right shoulder. It was reduced immediately. There were several dislocations during the next 4 years, and then he "caught a cold which seemed to settle in the right shoulder." For 4 months soreness prevented his lifting the arm to the head. After that he had numerous dislocations. Ten years before the examination he fell, and in catching himself, dislocated the left shoulder. The left shoulder, however, had not been dislocated for the last 2 years and we consider the dislocation merely the result of an ordinary trauma. The right shoulder was out of joint repeatedly, the last dislocation being 3 weeks before the examination. Capsulorrhaphy was performed June, 1914. In a communication, August, 1917, the patient asserted that he had had no further trouble and that he was getting along nicely. In February, 1920, 5 years and 8 months after operation, the patient dislocated his right shoulder, although he was not exerting it unusually. There have been no further dislocations up to October 8, 1920. This patient may be classed as being decidedly improved.

Case 5 (118613). Mr. R. V. A., a bookkeeper, age 33, was examined November, 1914. After a dislocation of the left shoulder 7 years previously he had had recurring dislocations, at least 12 a year. He sometimes threw the shoulder out of joint in reaching for something on a shelf. November, 1914, capsulorrhaphy was performed. The patient was not troubled until May, 1915, when he had a peculiar feeling that his shoulder was going to slip out of joint. In September, 1917, he reported that during the last year the shoulder had slipped out twice. The patient last reported September 29, 1920; he states that he considers himself greatly improved as he has had only three or four dislocations up to April, 1920, and none since that date, and he feels that the shoulder is getting stronger. I record his condition as decidedly benefited by the operation.

Case 6 (123803). Mr. S. F. L., a lawyer, age 25, was examined February, 1915. Eight years before he had dislocated his shoulder while playing football. It was dislocated the next time while he was swimming, the third time while he was playing baseball, and since it had even slipped out while he was sleeping. At the time of the examination, he was wearing a band around the body to hold the arm to his side. He had worn it steadily for a year and a half, thus averting dislocations. Capsulorrhaphy was performed February, 1915. The patient wrote from an officers' training camp, August, 1917, that he had been able to do his bit in such strenuous tests as digging trenches, bayonet exercises, and trench storming, without suffering the slightest inconvenience or trouble from the shoulder. A letter dated October 16, 1920, records that he has had no further trouble. He is classed as cured.

Case 7 (156847). Mr. J. C. S., a merchant, age 30, was examined April, 1916. Ten years before he had dislocated his shoulder. The dislocation remained for 2 days, and then reduced itself, which suggests that it was a subglenoid dislocation. The shoulder was later dislocated many times and the patient had to take gas, ether, or chloroform about ten times for reduction. In April, 1916, the Young operation was performed. In a letter dated August, 1917, the patient declared he had had no further trouble and that this shoulder seemed to be as strong as the other. His last communication was written April 8, 1920; he stated that during sleep 2½ years after the operation he had had a dislocation which required an anæsthetic for reduction. This patient cannot be classed as cured, but he is decidedly improved.

Case 8 (200995). Miss H. J., a nurse, age 33, was examined July, 1917. Thanksgiving day, 1915, she fell and dislocated her shoulder. It was reduced about an hour later, and was held to the side for 10 days. The next dislocation occurred Christmas day, 1916, and four dislocations later. Capsulorrhaphy was performed, July, 1917. The patient states that up to the time of writing, October, 1920, she has had no recurrence. She is classed as cured.

Case 9 (233633). Mr. C. O. M., a teacher, age 46, came to the Clinic for an examination June 4, 1918. Fourteen years before he fell on the left shoulder and dislocated it. He thought he had had at least thirty dislocations, three in the last 9 months. A pull on the shoulder reduced the dislocation so that it was not necessary to call medical aid. Operation, June 11, 1918, consisted of capsulorrhaphy and lengthening the tendon of the pectoralis major. A little more than a year after the operation dislocation occurred twice in one month. The patient wrote October 8, 1920, that the shoulder has been out of joint many times and that he is coming back for observation and advice. This operation evidently was a frank failure.

Case 10 (236286). Mr. E. B., age 20, who was examined June 24, 1918, is subject to epilepsy; the attacks occur about once a month. For 6 years he was in a hospital for the insane. During an epileptic seizure, six months previous to our examination, he fell against a radiator and dislocated the right shoulder. Later it dislocated during seizures or some trivial act such as throwing a stone or sneezing. June 29, 1918, a capsulorrhahpy was performed. Three months after the operation the right shoulder was again dislocated. A letter written September 18, 1920, by the superintendent of the State School

for the Feeble Minded, where the man is an inmate, states that now both shoulders dislocate during the epileptic attacks. The operation in this case must be classed as a failure.

CASE 11 (196886). Mr. E. P. H., a billiard room marker, age 37, was examined July 1, 1918. Ten years before he had been in a railroad wreck and the left shoulder had been dislocated. He reduced it himself by taking hold of a board and pulling hard. The shoulder reduced with a snap. The patient stated that he had had about eight dislocations in all. He insisted that the dislocation was always backward and posteriorly. July 6, 1918, when the patient was prepared for operation and thoroughly relaxed under the anæsthetic, I dislocated the shoulder posteriorly. Accordingly a posterior incision was made through the supraspinatus muscle, the capsule was opened and overlapped, as was also the muscle. A report from the patient, April 2, 1920, states that he has had no more dislocations but that he has an insecure feeling. Up to date he may be called cured.

CASE 12 (243697). Miss M. C., age 19, was examined August 27, 1918. Four years before the right shoulder had been dislocated; 1 year later it was dislocated during a basket ball game, and the same accident occurred once a year for 2 years, and then quite often. Capsulorrhaphy was performed September 13, 1918. The patient had had no further dislocations when last heard from in April, 1920, and may therefore be classed as cured.

CASE 13 (246611). Mr. G. W. G., age 41, a contractor, was examined September 24, 1918. The patient came for consultation primarily because of recurring, double, direct, inguinal hernias. The record, unfortunately, merely states that the patient had recurrent dislocations of the left shoulder for which a capsulorrhaphy was performed October 24, 1918. In a recent letter dated October 16, 1920 the patient reported that he has had no further dislocations. He may be classed as cured.

CASE 14 (246884). Mr. G. M., age 23, a farmer, examined September 26, 1918, had dislocated his right shoulder 2 years before. Six months later luxation occurred again, and during the last year it had occurred seven or eight times. October 10, 1918, a capsulorrhaphy was performed on the right shoulder. In a letter written during April, 1920, he states that he had a severe fall 11 months atter the operation which dislocated the shoulder, but he believed that the fall was sufficient to cause a normal shoulder to be dislocated. He may therefore be classed as decidedly improved.

CASE 15 (289163). Mr. W. L., age 35, who was examined September 13, 1919, had had epilepsy since he was 15, but came to the Clinic for the purpose of having the right shoulder fixed, if possible, so that it would not dislocate so easily. Four years before the examination the first luxation had occurred and there had been about fifteen since. Capsulorrhaphy was performed September 22, 1919. A letter received in October, 1920, states that there has been no dislocation. Although the time is short this patient may thus far be called cured.

CASE 16 (274650). Mr. F. F., age 29, was examined December 12, 1919, because of a dislocating right shoulder. The first dislocation was sustained during a wrestling bout; six or seven had occurred since, in one instance when he was swimming and in one when he sneezed. December 16, 1919, the usual capsulorrhaphy was performed, except that an attempt was made to include more tissue in the overlapping, and two strands of silk were used. The operation was made more difficult than usual by the greater amount of hæmorrhage, and the patient was quite muscular so that exposure was difficult. A numbness of the right hand followed the operation; this gradually improved. February 4, 1920, a neurologic examination by Dr. Sheldon and Dr. Woltmann showed an irregular distribution of sensation and they believed that the condition was merely a traumatic neuritis of the brachial plexus and that no nerve or nerves could be singled out as being involved. This is the only case in our series in which trauma was inflicted on the nerves and the only explanation I can offer is that in some way our efforts in retracting to obtain exposure were too vigorous. A letter from the patient during September, 1920, states that he has had no trouble with the shoulder except a feeling of weakness, but his hand is still numb in the little and ring fingers, and the power in these fingers is weak. Evidently the ulnar nerve is involved. It may be said for the present that he is cured.

CASE 17 (300320). Mr. M. R., age 22, was examined March 17, 1920. Three years before in jumping over a fence and holding the arms abducted, as one does in jumping over an obstacle, the right shoulder dislocated. The dislocation occurred twice afterward, the last when he jumped from a bobsled 2 weeks before our examination. This case is of interest, since in so far as we could learn, there had been no primary severe trauma such as had occurred in the other cases. March 23, 1920, capsulorrhaphy was performed and the pectoralis major was lengthened. The case is too recent to include in reporting results.

CASE 18 (320106). Mr. E. H. N., age 22, examined June 16, 1920, while playing football in September, 1914, had dislocated his left shoulder. One month later while again playing football the joint luxated. Following this the patient had seven dislocations, one while swimming, and one while in bed after a 15 months' interval. June 18, 1920, a capsulorrhaphy was performed; the sheaths of the teres major and of the pectoralis major were lengthened. The operation is too recent from which to judge ultimate results.

CASE 19 (326010). Mr. G. C. P., age 36, was examined February 22, 1920. This patient had had epilepsy for 8 years but the first dislocation of the left shoulder occurred 5 months before our examination. A second dislocation had occurred 6 weeks before during a seizure. Unfortunately the doctor

in reducing it broke the surgical neck of the humerus. An open operation was performed and good position was secured, but during an epileptic attack (these attacks usually came on during sleep) the shoulder luxated. When we saw him the position of the fracture was so poor and the dislocation had been present so long that my colleague, Dr. Meyerding, excised the head. We have not heard from the patient since his dismissal August 24, 1920, but at that time function promised to be good.

CONCLUSIONS

1. Capsulorrhaphy to strengthen the shoulder gave 50 per cent cures in the 16 cases of habitual or recurrent dislocation of the shoulder. Five of the patients (31.25 per cent) are so decidedly improved that they are more than satisfied with the operation. This percentage of improvement and the percentages of cures give good results in 81.25 per cent.

2. It is probable that muscle pull or possible relaxation of the shoulder capsule above has not been sufficiently considered in the treatment. It is reasonable to suggest, therefore, that the pectoralis major, teres major, and latissimus dorsi be lengthened, and, if thought necessary, the region of the capsule where the supraspinatus and infraspinatus are inserted and the anterior inferior portion of the capsule be reefed.

I wish to thank Dr. H. T. Jones, assistant in the section on orthopedic surgery of the Mayo Clinic, for his assistance in looking up the literature and in tracing the patients.

BIBLIOGRAPHY

1. Burrell, H. L., and Lovett, R. W. Habitual or recurrent dislocation of the shoulder. Am. J. M. Sc., cxiv, 166-179.
2. Clairmont. Ueber neue Operationsmethoden bei habitueller Schulterluxation. Wien. klin. Wchnschr., 1917, xxx, 1507.
3. Eden, R. Zur Operation der habituellen Schulterluxation unter Mitteilung eines neuen Verfahrens bei Abrisz am inneren Pfannenrande. Deutsche Ztschr. f. Chir., 1918, cxliv, 269-280.
4. Idem. Habituelle Schulterluxation. Muenchen. med. Wchnschr., 1918, lxv, 468.
5. Finsterer, H. Die operative Behandlung der habituellen Schulterluxation. Muenchen. med. Wchnschr., 1918, lxiv, 360.
6. Gerster, A. G. Fracture of the humerus and scapula, complicated with severe injury of the entire brachial plexus, followed by paralysis. Med. News. 1884, xliv, 421.
7. Henderson, M. S. Recurrent or habitual dislocation of the shoulder. J. Am. M. Ass., 1918, lxx, 1-4.
8. Joseph, E. Eine neue Operation zur Verhuetung der habituellen Schulterverrenkung. Berl. klin. Wchnschr., 1917, liv, 525.
9. Ricard. Quoted by Burrell and Lovett.
10. Rivière, G. Capsulorraphie de l'articulation de l'épaule pour luxation recidivante. Lyon chir., 1918, xv, 437-439.
11. Thomas, T. T. Habitual or recurrent anterior dislocation of the shoulder. I. Etiology and pathology. Am. J. M. Sc., 1909, cxxxvii, 229-246. II. Treatment. 367-377.
12. Idem. Recurrent anterior dislocation of the shoulder. J. Am. M. Ass., 1920, liv, 834-841.
13. Idem. Habitual or recurrent dislocation of the shoulder. Surg., Gynec. & Obst., 1914, xviii, 107-115.
14. Young, J. K. Recurrent dislocation of the shoulder-joint. Ann. Surg., 1916, lxiii, 375.
15. Idem. Recurrent dislocation of the shoulder. Interstate M. J., 1916, xxiii, 312-317.

ARTHROPLASTY OF THE JAW

With Some General Remarks on Focal Infection and on the Formation of New Joints[1]

By JAMES M. NEFF, M.D., F.A.C.S., Chicago

THE case which is reported below is rather unique in the following particulars:

First, the ankylosis had been present for 7 years, developing during an attack of uræmic coma in the later months of pregnancy. At that time the patient had suppuration in the mouth, presumably around some of the teeth, but she does not know which side was affected, or whether the trouble was on both sides. All that she could remember was that there was "pus" coming from the mouth at the time and when she recovered from the coma, the jaw was firmly fixed with the teeth of the maxilla and mandible in close apposition. Since that time she has been unable to open her mouth. Some of the teeth on the left side were extracted so that she could take soft and liquid food, upon which she has subsisted ever since.

Second, the age of the patient. She is now 39 years old, so the ankylosis developed when she was between her thirty-second and thirty-third year.

Third, the presence of a persistent and continuous nephritis from the time the trouble started, with much albumin in the urine, epithelial, granular, and hyaline casts and many leucocytes. The systolic blood pressure at the time I first saw her was 165 to 170 mm. with 95 to 100 diastolic.

Fourth, the presence, in association with the nephritis, of a marked infection around the roots of nearly all of the teeth. The abscesses around some of the teeth, as shown in the roentgenograms (Figs. 1 and 2) were very large and some of the teeth were so loose that they could be picked out with the fingers. She had had no dental work done at any time since the onset of the trouble.

Fifth, the diminution of albumin and the lowering of the blood pressure following the removal, at time of operation, of the abscessed teeth and the drainage of the pus pockets, so that only a trace of albumin was present, with an occasional pus cell and hyaline cast and the blood pressure remained down.

Sixth, the roentgenograms of the temporomandibular joint (Figs. 1 and 2), made by Dr. Hollis Potter, showed the left joint normal, but the articular surface of the condyle on the right side was irregular and the space obscure though one could not say whether or no there was a fibrous ankylosis within the joint.

Seventh, the chin was retracted to a noticeable degree with the result that the lower incisor teeth were posterior to the upper to an abnormal extent—a rather unusual finding in cases developing so late in life.

Eighth, the impossibility of determining by the most careful examination of the patient which side the fixation was on or whether it involved both sides. Examination of the inside of both cheeks showed the masseter muscles very tense and the anterior edges sharp and firm. It was quite certain that the fixation was extra-articular, but nothing more could be said before operation.

These are the main points of interest in the case herein reported, except the operation and findings, which will be related later.

Examination of the patient showed that she was fairly well nourished, with heart, lungs, and abdomen, negative. The condition of the teeth in general has been described above. The lower jaw could be moved downward to the extent of about ⅛ inch, as measured by the incisor teeth. There was also about the same degree of lateral motion. The X-ray findings and the condition of the jaw are described above. It was absolutely impossible to say which side was involved or whether it was on both.

Operation, January 31, 1921, at the Michael Reese Hospital. Gas anæsthesia throughout. A semicircular incision was made over the right zygomatic process, convexity upward, through the skin and subcutaneous fat, and this flap was turned downward. The zygomatic process was now exposed by an incision through the temporal fascia, well posterior and in a direction forward and upward. This

[1] Read before the Chicago Medical Society, April 6, 1921.

Fig. 1 (at left). Roentgenogram of the left temporomandibular joint, showing clear space, *a*, between the condyle and mandibular fossa.

Fig. 2. Roentgenogram of the right temporomandibular joint. The space, *a*, between the condyle and the mandibular fossa is not clear nor well defined. Note also the alveolar process of the maxilla. The teeth are loose and show abscesses around the roots.

incision is most important to avoid the temporal branches of the facial nerve. The soft tissues were retracted forward and slightly downward, after separating them from the zygoma with a periosteotome. One-half inch of the zygoma was resected by means of a gigli saw, but was not preserved for transplantation. The temporomandibular joint was now carefully exposed and found to be normal, so far as the interior of the joint was concerned. The coronoid process was next exposed and it, with the insertion of the temporal muscle, was resected. No movement of the jaw followed. The tense portion of the masseter muscle was divided anteriorly with no result. As is usually necessary in extra-articular fixations, the neck and condyle were resected at a point one-fourth inch below the base of the condyle. Even now there was absolutely no motion in the jaw. The bleeding was controlled and the same incision and exposure were made on the left side. One-half inch of the zygoma was resected and the left temporomandibular joint was found to be normal. The left coronoid process with insertion of the temporal muscle was resected without the slightest effect as regards motion. The tense portion of the left masseter muscle was divided without result. There remained but one thing to do and that was to resect the left condyle with ¼ inch of the neck. This was done, and at once the jaw opened to the extent of 1 inch, as measured by the distance between the upper and lower incisor teeth. No muscle, fascia, nor any other substance was interposed between the mandibular fossa above and the neck of the condyloid process below. The bleeding on both sides, which was not profuse, was permanently controlled by ligature and the skin flaps brought up and approximated with horse-hair sutures. A small rubber drain was placed in each wound at the posterior angle and allowed to remain for 24 hours. Forty-eight hours after operation the face was enormously swollen, but this had completely subsided on the fifth day. The wound healed by primary union and the patient was sitting up on the sixth day.

The rapid and steady improvement in the urinary findings and blood pressure has been noted above. After the swelling had subsided, passive movements of the mandible were painless and normal in degree. As regards the active motion, she could open the mouth to the extent noted above but could not completely close it, that is, the upper and lower alveolar processes could not be brought into complete approximation and the lower process was 3/16 inch posterior to the upper. However, this retraction was present before operation. The ability to close the mouth has steadily improved since operation.

In regard to the temporal branches of the facial nerve, 2 weeks after operation, when the patient

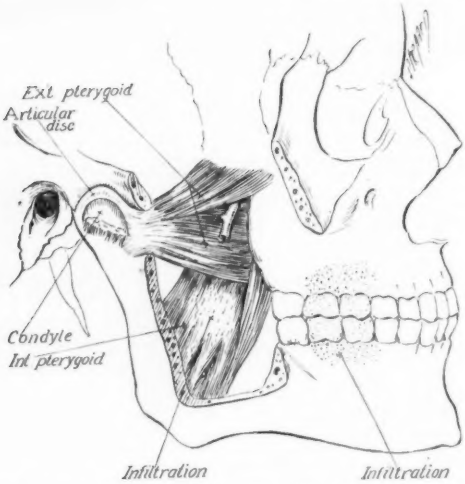

Fig. 3. The pterygoidei internus and externus. The light area in the internus shows where a fibrous infiltration might take place and act as a fulcrum, extending from above to the angle of the mandible. This same fulcrum action would be possible if fibrous tissue extended from maxilla to mandible, as shown in the dotted area. The action of the muscles is explained in the text. (Redrawn from Gray's *Anatomy.*)

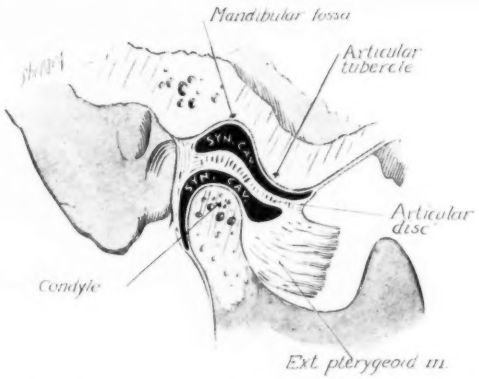

Fig. 4. Showing the complicated structure and intricate function of the temporomandibular joint. (Redrawn from Gray's *Anatomy.*)

left the hospital, there was partial loss of function of the frontalis muscle on both sides and of the corrugator and orbicularis on the right side. This was associated with frequent twitchings of the orbicularis on the right. These twitchings, together with the fact that every effort as regards the incision, exposure, and retraction of the soft parts was made at the time of operation to avoid the nerve, lead me to believe that the interference with the function of the nerve was temporary and due to traction, rather than division of the branches. The last report received from the patient, 6 weeks after operation, states that the motion of the mandible has improved a great deal and the function of the facial nerve is again quite normal (Figs. 9 and 10).

I have described the operation in this case in detail, because the mechanism of fixation and the pathology seem to me rather unique. It was not until the resection of the coronoid processes, with the insertion of the temporal muscles, the division of the tense portion of the masseters and the resection of both condyles, with one-fourth inch of the necks, had been performed, that the mandible could be moved the slightest fraction of an inch more than before operation. It was just as firmly fixed up to the last step of the operation (the resection of the left condyle), as it was before the operation was commenced. This leads me to believe that the fixation was due to infiltration and scar tissue formation in the soft tissues of both cheeks, near the mucous membrane, probably about the middle of the mandible, laterally, or in the internal pterygoid muscles (Fig. 3), where the mechanical effect would be the same. I say this because I divided both temporals and the tense portion of both masseters, as well as resected one condyle, without result. When the other condyle was resected, the mouth opened, due to the fact that the last portion of the posterior end of the double lever, the condyloid process, had been removed, thus allowing the anterior end of the lever, the chin, to drop down. In this case, of course, the fulcrum was in the middle of both sides of the lever (the mandible), or at the angles (the insertion of the internal pterygoids), and consisted of scar tissue, attached above to the sides of the maxilla and below to the sides of the mandible, at about their centers, or at the angles, where the internal pterygoids insert. This seems to me to be the only logical explanation of this particular case and probably applies to extra-articular ankyloses, where both condyles must be resected to secure motion. So much for the case herein reported.

ANATOMY

To understand the pathology and mechanics of the different forms of ankylosis of

the jaw, it would seem advisable to review briefly the anatomy of the temperomandibular articulation. The joint is of the ginglymo-arthrodial type (1), that is, the motion in it is a combination of the hinge and gliding movement, the former predominating. The movements permitted are extensive: the mandible may be depressed or elevated, carried forward and backward, and there is a slight side to side motion. There are two distinct joints in the articulation; one between the disk and the mandibular fossa, and the other between the articular disk and the condyle (Fig. 4). When the mouth is opened widely both joints come into play, the hinge action taking place in the lower, the gliding in the upper, where the disk glides forward on to the articular tubercle. In closing the mouth, the reverse action takes place. When the jaw is protruded forward the action takes place in the upper joint (gliding motion). In the act of chewing, the condyles glide alternately forward and backward, one remaining in place and rotating vertically on its disk.

The different movements of the mandible are produced by the following muscles (Figs. 3 and 5): It is elevated by the masseter, the internal pterygoid and the anterior part of the temporal muscle. It is depressed by its own weight, and the platysma, digastricus, mylohyoideus and the geniohyoideus muscles. It is drawn forward by the pterygoidei, internus and externus (Fig. 3), the superficial portion of the masseter and the anterior fibers of the temporalis. Chewing is produced by the alternate action of the pterygoidei on each side (see Fig. 3). The anatomy of the bones and ligaments is sufficiently clear from the cuts taken from Gray's *Anatomy*. The reason for going into the anatomy and physiology so in detail is to show how complicated is the structure and action of these joints and how they work together, simultaneously in an intricate manner, in the apparently simple act of mastication. From these facts there is but one conclusion to be drawn and that is that in every case of ankylosis operated on, whether it be articular, extra-articular, or articular-extra-articular, the result must fall very far short of the normal function, much more so, than, for example, in the elbow. In other words, the very best result, in the hands of the most skillful operators, must of necessity be far from perfect, because it is impossible to make a new joint, which even approximates the normal in structure. That however, does not contra-indicate operation, as the restoration of even moderate motion in the joints is to be looked upon as an enormous improvement over ankylosis. In fact, in my opinion, there are but three joints in the body where arthroplasty is indicated and they are: the elbow, the temporomandibular, and the tarsometatarsal joint of the great toe, the last in cases of bunion. In the first two, motion is of greater importance and can be secured in a greater percentage of cases, than in any other joints in the body. The reasons for this will be explained later.

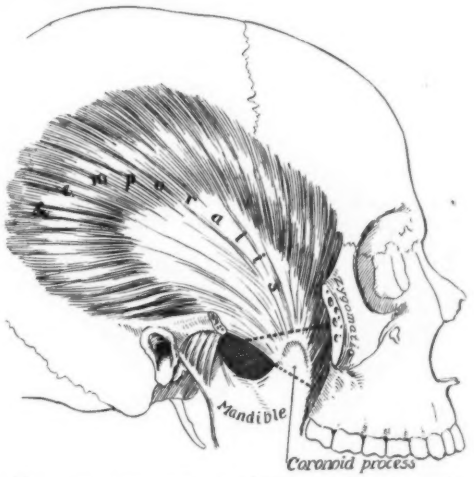

Fig. 5. The temporalis showing its origin and insertion into the coronoid process. The dotted lines show where the coronoid process may be resected with the insertion of the muscle. The action of the muscle is explained in the text. (Redrawn from Gray's *Anatomy*.)

PATHOLOGY AND PATHOLOGICAL ANATOMY OF TEMPOROMANDIBULAR ANKYLOSIS

The classification as to the location of fixation as given by Henderson and New (2) is the most logical. They report 23 cases treated in the Mayo clinic and divide them as follows: (a) articular, where the fixation is within the joint; (b) extra-articular, where it

is outside the joint; and (c) articular-extra-articular, where it is both inside and outside the joint. Fifteen of their 23 cases were articular; 5, extra-articular; and 3, articular-extra-articular.

In the majority of the articular type, the ankylosis occurred between the ages of 1 and 10 years. In the extra-articular and articular-extra-articular, it developed with equal frequency in the first three decades.

If the ankylosis is unilateral and develops early in life, before the jaws are fully formed, a typical deformity results. The chin is retracted and displaced toward the affected side, while the normal side appears flat. There is considerable elasticity to the mandible, so that even in cases of unilateral bony ankylosis, there is some movement when an attempt is made to open the mouth. This movement is necessarily on the normal side, causing the chin to move toward the affected side.

The motion is greater in cases of fibrous ankylosis and where the fixation is outside of the joint. Of course, in bilateral bony ankylosis, there is no motion at all. *In the articular types* the pathology is simple. There is:

1. Bony union of the condyle with the mandibular fossa, or, zygoma, mandibular fossa and condyle may form a continuous bony mass;

2. There may be a great deal of fibrous tissue around the joint;

3. The joint may be filled with cartilage and bone, uniting the two articular surfaces (3);

4. The bones may be united by fibro-osseous tissue; or,

5. The joint cavity may be traversed by fibrous bands, between which are small spaces, containing synovial fluid.

Of these changes, 3, 4 and 5 are usually found in the earlier and intermediate stages, because in the long standing cases, the joint cavity is completely obliterated by fibrous tissue or bone. For a detailed description of the changes taking place in the joint, see Lyons' article above referred to.

6. In all the long standing cases where there has been inflammation within the joint, the capsule is thickened and united with the tissue in the joint.

7. In the cases which develop early in life, before the jaws are fully formed, the ramus on the affected side is shortened, because the growth of the bone has been interfered with.

8. This early fixation and shortening of the ramus, causes a retraction of the chin and a deflection of the same toward the affected side.

9. In all long standing cases, the muscles of mastication are atrophied from disuse and often show fibrous changes. This is especially true in the temporal and masseter muscles. The constant attempts to open the mouth probably contribute toward the retraction of the chin.

In the extra-articular cases due to infections and abscesses from the teeth or in the cheeks, there is scar tissue formation in and around the muscles and around the joint itself. This fibrous tissue may stretch from the maxilla to the mandible, firmly fixing the jaw as was probably so in the case here reported. In old cases, particularly, the teeth are always in very bad condition, because, on account of the fixation of the jaw, no dental work can be done. By "bad condition" I mean there is frequently pyorrhœa, caries and abscesses at the roots, in the alveolar processes.

ETIOLOGY

Lyons says that the sexes are about equally affected. As regards the age at which the pathological changes take place, Henderson gives the following statistics from the Mayo clinic. Among the 15 articular cases, 9 developed between 1 and 10 years, 3 between 11 and 20 years, 2 between 21 and 30 years, and 1 after 30. Of the 8 extra-articular and articular-extra-articular cases, 2 developed during each of the first three decades, one in the fourth and one in the fifth.

Traumatism and infection are responsible for the great majority of cases of ankylosis of the jaw, both of the articular and extra-articular types. The forms of traumatism of greatest importance are falls or blows on the chin, recurring dislocation of the jaw and direct injuries over the joint itself. These statements apply especially to the articular form. Vecchi (8) has observed that falls on the chin may lead to temporomandibular

ankylosis on both sides, but that when the trauma is direct, the ankylosis is unilateral. In the extra-articular and articular-extra-articular forms, infection plays by far the more important part. The infection may be direct or indirect. By *direct*, I mean it has extended from some neighboring source of infection, as from the teeth, the middle ear, an abscess in the cheek or from an osteomyelitis of one of the bones that goes to make up the joint or one in the neighborhood. By *indirect*, I mean that the infection has come through the blood stream, as during the course of any of the infectious diseases, for example, scarlet fever, measles, typhoid, gonorrhœa, etc. The infection may or may not be associated with pus formation in or around the joint. As regards focal infections playing an important part in temporomandibular arthritis, or that of any other joint in the body, I think it is greatly overestimated, *as the question now stands*. The same may be said of its rôle in neuritis, myositis and a thousand and one other conditions, where it is held responsible for the trouble; for example, appendicitis, cholecystitis, duodenal and gastric ulcers, etc.

Any one who has an open mind and is not prejudiced by what he has heard and read on the subject of focal infection, must surely see at a glance that there is in it but a grain of truth and a pound of rubbish, *in the present conception of the subject*. The personal case reported is the grain of truth, because the albuminuria, with casts and high blood pressure, which had existed for 6 years, disappeared within 2 weeks after the infected teeth had been removed, but in my own personal experience, both civil and military, I have seen the pound of rubbish, as has everyone else with similar experience. It is merely a case of every day observation on the part of the one with average intelligence and intellect and a logical mind, against one with equal intelligence and intellect, who works in a bacteriological and pathological laboratory, experimenting on animals, but who has fixed ideas on the subject of focal infection. The one who has fixed ideas and is constantly at work to prove them, has of necessity a less logical mind than the aforesaid one who carefully observes large numbers of cases.

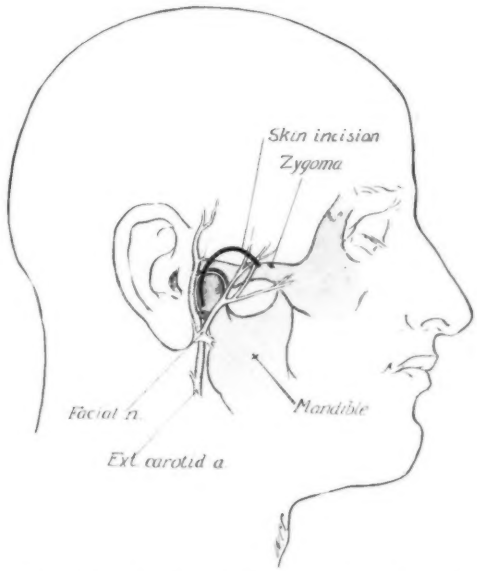

Fig. 6. Showing the curved incision through the skin and superficial fat, with its relations to the zygoma, the superficial temporal artery, and the temporal branches of the facial nerve, as they cross the zygoma.

I spent a year in active service in France with the English army during the great war and observed a very large number of cases. The English soldiers had notoriously "bad teeth"; the great majority of them had never been to a dentist, the teeth were carious, many of them had cavities and pyorrhœa was common. It is logical to assume that in such teeth, infections and even abscesses at the roots must be the rule and not the exception, but notwithstanding these facts, it would be difficult to imagine a finer group of men. They were examples of perfect physical health and fitness, and diseases, such as neuritis, myositis, arthritis, appendicitis, cholecystitis and duodenal and gastric ulcers, were extremely rare among them while in the training and reinforcement camps. After being in the trenches for prolonged periods of time, under abnormal and extremely trying conditions, they did develop neuritis, myositis, and arthritis, just as any normal individuals might, who had been taken away from healthful environ-

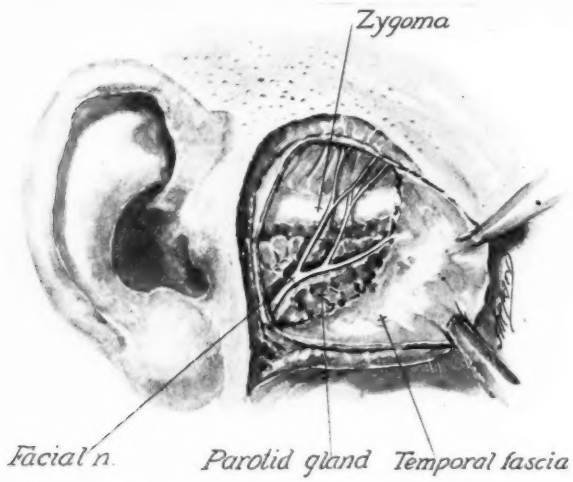

Fig. 7. The temporal branches of the facial nerve as they cross the zygoma. The flaps of skin and temporal fascia have been dissected forward and retracted. (From a dissection.)

ments and placed under these same abnormal and trying ones. Furthermore, there was no greater proportion of cases of appendicitis, cholecystitis, and duodenal and gastric ulcers, than is observed among persons who have their teeth properly cared for. The same applied to the tonsils. Very few of the soldiers, who to all intents and purposes, were in perfect health, had had their tonsils removed, and yet it is safe to say that if a nose and throat specialist had examined them, the same proportion, as in any civil community, would have been advised to have their tonsils removed, on account of enlargement, "pus pockets," crypts, etc., or to have operations on the nose to relieve sinus infections, deflected septums or enlarged turbinates.

To my mind the focal infection theory is very greatly overdone. I have seen hundreds of persons whose teeth have been condemned by dentists, and hundreds whose tonsils have been examined by throat specialists and pronounced "diseased," because of enlargement or because "pus" could be expressed by pressure, and yet these persons have remained in good average health, having consulted the doctors or dentists, for some temporary ache or pain. Furthermore, I have seen many cases of neuritis and arthritis, who have had their teeth "treated" or extracted, or their tonsils removed, or both, and who have continued to suffer from their ailments for a very prolonged period of time after their operations. It is well to remember that medicine and surgery are not mathematical sciences, in fact, not sciences at all, and therefore fads and fancies are certain to creep into them. During the past 20 years that I have been in the surgical profession, I have seen many fads and fancies come and go, so I know whereof I speak. I believe that the time has come for a reaction against the focal infection theory, so that it may find its proper level. On the other hand, I think that all tonsils that are really diseased and causing definite trouble, should be removed and that the teeth should be kept in as nearly perfect condition as possible; this is merely logical reasoning, as applied to the individual; but to attribute every ache and pain and every abdominal disease to some focal infection; that is going too far. It might also be added that there are about 23 feet of small intestine, 5 feet of large intestine, the œsophagus, stomach, the genito-urinary tract and the

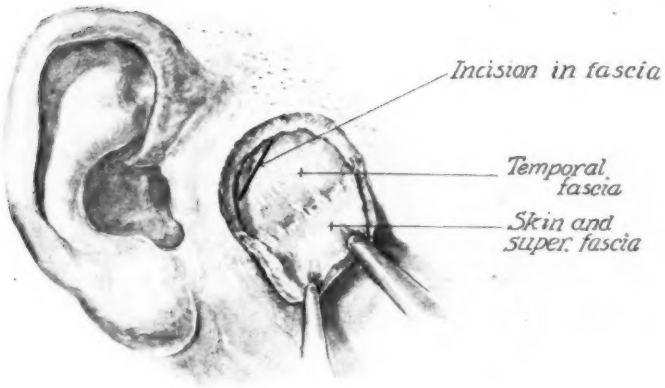

Fig. 8. The curved incision has been made through the skin and superficial fat and the flap dissected downward and forward, exposing the temporal fascia. The black line shows the straight incision through the temporal fascia, upward and forward, over the zygoma and well posterior. This is to avoid the temporal branches of the facial nerve. (From a dissection.)

entire skin surface, which might, in some portion of their enormous extent, harbor a focal infection. Yet how seldom do we hear that a lesion of the joints, nerves, bones or abdominal organs, might be due to a focus of infection in any of these structures. Of course, the argument will be brought forth that the organisms in the tonsils and teeth are different from those found in the above mentioned lesions and are more prone to enter the blood stream and thus give rise to metastatic inflammatory processes, but again I insist that medicine, surgery and their allied branches are not mathematical sciences and absolute deductions cannot be made from laboratory or clinical studies. Also, the subject of focal infections is still an open one and by no means settled in the minds of logical thinkers, which, of course, could not be the case if it were a proved fact.

SYMPTOMS

The symptoms are evident from the pathology, which has been described. During the inflammatory stage there is pain in the joint, especially on motion, with tenderness on pressure over it. In addition there are all the symptoms of the etiological factor, whether it be traumatism or infection, or both. When the patients come for surgical relief, which is usually several years after the development of the trouble, they are as a rule well nourished and complain of no trouble, except, inability to open the mouth and take solid food, the "bad" condition of the teeth, and there may be some digestive disturbances, such as constipation, gas formation, etc., due to the fact that the patients are obliged to live on liquid and soft food, which as a rule is concentrated and leaves no residue.

PROGNOSIS AND GENERAL CONSIDERATIONS ON ARTHROPLASTY

The outlook in cases of arthroplasty on the jaw is good as regards motion. Of course, the motion can never be free and normal, on account of the intricate formation of the joint and its complicated movements, but the patients operated on are able to masticate food in the course of a few weeks, the facial expression is better, the speech is improved and they are able to keep the teeth in good condition.

Thomson (7) thinks that arthroplasty yields excellent results in cases where the ankylosis has been produced by traumatism, but that it is very likely to fail if the fixation has been produced by infection, because the infection, which has been encapsulated for a long time,

Fig. 9 (at left). Showing patient after operation. Mouth closed.

Fig. 10. Patient after operation. Extent to which mouth can be opened.

may be "lighted up" by an operation, and there may be an increased formation of bone after the operation, causing a return of the ankylosis. I think this is true if the infection is tubercular, but not true if it is other than tubercular, and sufficient time be allowed to elapse between the acute process and the operation of arthroplasty. This period of waiting should be at least 6 months.

I consider that ankylosis of the temporomandibular and elbow joints are, *with an occasional exception*, the only two indications for arthroplasty. This brings up the very important question as to what makes for good results in arthroplasty. In my opinion the following conditions are necessary for a good result: articular surfaces of *small area*, very limited gliding motion within the joint, and the absence of great pressure within the joint. It fortunately happens that the two joints in the body where free and painless motion are most necessary, meet with these requirements, e.g., the temporomandibular joint and the elbow. It is well to remember that in all of the important joints of the body, where arthroplasty would be considered, sliding or gliding of one articular surface upon another is necessary to produce motion. It makes no difference whether the motion is of the ginglymus (hinge), trochoid (rotary), condyloid or enarthroid (ball and socket) variety, the smooth synovial surfaces slide one upon the other, during motion. Where the important motion is limited in extent, as in the jaw, fibrous union of the bones, may take the place of a joint or bursal cavity with sliding surfaces, but this is not true of the other important joints. In the elbow, knee, hip and shoulder, bursal formation must take place before extensive and painless motion can be produced. In the knee and hip we occasionally see successful arthroplasties, but the failures greatly outnumber the successes. A painless bony ankylosis of the knee in extension, is very much better than a painful arthroplastic knee, even though the motion be quite normal and extensive. The same applies to the hip, provided, of course, the ankylosis is not bilateral. Painful motion is often seen in both of these joints after arthroplasty, because, great weight must be borne in both, when walking or standing and, especially in the knee, very extensive sliding motion, which in turn means extensive bursal formation, is necessary, if there is to be any degree of useful motion. These extensive sliding surfaces are seldom produced by any method. Therefore, I consider arthroplasty usually contra-indicated in both knee and hip, and think that the production of a bony ankylosis with the limb in good position, is much to be preferred. These patients get about very well and with but little inconvenience. I have, however, seen wonderful results follow arthroplasty, in both hip and knee (4), but they are the exception and not the rule. Arthroplasty on the shoulder is contra-indicated, because the scapula will follow the humerus in all of its useful and necessary movements, provided, of course, that it is ankylosed in good position. The operation on the wrist and ankle is never indicated. For the earlier references on arthroplasty, see an article published by me in SURGERY, GYNECOLOGY AND OBSTETRICS, in 1912.

The operation for relief of ankylosis of the jaw is not new, the first attempt having been made by Esmarch in 1855. He removed a wedge-shaped section of the bone from the horizontal portion of the mandible, but it did not prove successful. In 1878 Koenig introduced the operation of resection of the mandibular head (3). The credit for modern arthroplasty, not only on the jaw, but on all

of the other joints, belongs to the late Dr. John B. Murphy, of Chicago, who did the best work in this branch of surgery that has ever been done by any surgeon, though he was preceded by others in both experimental and practical work, notably Chlumsky, Glueck and Koenig.

TREATMENT AND DIAGNOSIS OF ANKYLOSIS OF THE JAW

All surgeons agree that forcible separation of the jaws is worse than useless, because the ankylosis, whether it be bony or fibrous, is certain to recur and the patient is put to a great deal of unnecessary suffering. The operation of resecting a part of the horizontal portion of the jaw is almost equally useless, because the bone will unite if the wound heals by primary union, or there will be a painful discharging wound if it becomes infected and union fails to take place. These points being true we are left to deal by open operation, with the condyloid process, the joint itself and the structures around it. The type of operation indicated will depend entirely upon the pathology and the form of ankylosis present. Now, it is rather difficult in certain cases, as in the one here reported, to say, before operation, just what the pathology is, and even during the operation the difficulty may persist until the very last step, as in this same case. The X-ray films in this case showed that in all probability there was no bony ankylosis, but the right articular surface was irregular and the cavity obscure. There was no other pathology except in the alveolar processes at the roots of the teeth. In the cases of bony ankylosis that occur early in life, before the jaw is fully formed, the typical deformity with shortening of the ramus, deflection of the chin toward the affected side and flattening of the cheek on the opposite side, make the diagnosis easy. In some cases the X-ray films make the diagnosis of bony fixation. If there is absolutely no motion of the jaw, bilateral bony ankylosis is present. If there is slight motion on one side, with absolute fixation on the other, there is unilateral bony ankylosis. If there is a small degree of lateral and vertical motion on both sides, the probability is that the case is one of extra-articular or articular-extra-articular fixation. In all of these cases the open operation is indicated. If an absolute diagnosis as to the condition present and side affected can be made before operation, so much the better; if not, it must be made during the operation and, whatever procedure is necessary, must be carried out at the time. In many cases it is exceedingly difficult to say which side is affected unless the typical deformity is present.

The incision necessary to expose the joint is over the zygoma, semicircular (Fig. 6) or angular, with the longer arm posterior in front of the ear; upward, if the horizontal portion is along the lower margin of the zygoma (Lyons, 3) and downward if along the upper border (Henderson, 2). The structures to be avoided must be carefully borne in mind: (a) the temporal branches of the facial nerve and (b) the internal maxillary artery, which is the larger of the two terminal branches of the external carotid artery. It arises just behind the neck of the mandible and passes forward between the ramus and the sphenomandibular ligament. It is, therefore, easily injured and causes very troublesome hæmorrhage unless precautions are taken to avoid it. This is very easily done if the operator, after exposing the temporomandibular joint from above, adheres closely to the bone in separating the soft tissues from the neck. Lyons uses a steel ribbon 1 centimeter in width around the condyloid neck to avoid injury to the artery, but this hardly seems necessary if one is careful. Injury to the superficial temporal artery is not serious, as the vessel can be readily ligated if injured. Injury to the temporal branches of the facial nerve is the most serious accident that might happen during the operation. After the facial nerve emerges from the stylomastoid foramen it runs forward and divides behind the ramus of the mandible into its branches of distribution. It is with the temporal branches that we are chiefly concerned. They cross the zygomatic process a little anterior to the external meatus, under the temporal fascia (Fig. 7) and pass to the temporal region, supplying the auricularis anterior and superior. They then join with

branches from the maxillary and mandibular to supply the frontalis, orbicularis-oculi and corrugator. The best way to avoid these nerves is to make the curved incision mentioned above (Fig. 6) beginning an inch in front of the external meatus, curved backward over the upper border of the zygoma and downward for ¾ of an inch in front of the ear. This is through the skin and superficial fat, a flap of which, is retracted downward and forward (Fig. 8). The zygoma is then exposed by another incision ¾ of an inch long through the temporal fascia well posterior and running upward and forward (Fig. 8). The temporal fascia with the temporal branches of the facial nerve are now separated from the zygoma by means of a periosteotome and retracted in a direction forward and a little downward. About ½ inch of the zygoma is now resected, after which the condyle will be seen in the posterior portion of the wound. If bony ankylosis exists, the joint surfaces should be chiseled apart and the condyle with ¼ inch of the neck removed.

The best way to divide the bone in this situation, is with a straight bone cutting forceps. The bone is not cut through with one bite, but is divided by a series of small bites, beginning at the side of the neck and going a little deeper with each successive bite. In this way no unnecessary traumatism is done and it is surprising how easily any bone may be divided in this manner. If the jaws open widely and freely after this, nothing more is necessary, except to control the hæmorrhage and close the wound, with or without 24 hour drainage.

For fibrous ankylosis within the joint the same procedure should be followed. It is not necessary to turn in a flap of muscle or fascia, as the soft tissues will come together between the bones without flap formation, and fibrous union or bursal formation take place. Many operators, however, have in the past and do now, advocate turning in a flap of the temporal muscle or fascia to prevent union of the bones or produce a bursal formation between the ends. Nearly all of Dr. J. B. Murphy's work was done after this manner. (For references on the work of J. B. Murphy in temporomandibular ankylosis, see the article by Henderson and New, 2). Vecchi (8) also reports in detail a case to illustrate the good result following a resection, with the interposition of a muscle flap. It is probable that with or without a flap, fibrous union occurs, which answers the purpose here just as well, because the important motion is limited in extent and sliding surfaces are not absolutely necessary to good, if not entirely normal, function.

If the ankylosis is extra-articular, the fixation will be found to be due to fibrous tissue formation, either within the muscles of mastication, the temporal, masseter or pterygoids, or outside them, near the mucous membrane of the mouth, which is the more common, or toward the skin surface, which is less common. Chubb (5) reports 5 cases in which removal of the coronoid process with the insertion of the temporal muscle overcame the ankylosis, and New (6) records another case of ankylosis due to fixation of the temporal muscle, following an operation for removal of the gasserian ganglion 3½ years before. He resected the coronoid process, with the insertion of the temporal muscle, and secured a good result.

Where the fibrous tissue is outside the muscles, it must be dealt with accordingly, great care being taken not to enter the buccal cavity, as in this case, infection of the wound, with its disastrous sequelæ would result. When the jaws will not open after the extra-articular bands have been divided, or where all of these bands cannot be found after opening both sides, and in practically all long standing cases, as in the one herein reported, resection of one or both condyles for ¼ or ⅜ inch of their extent, is the proper procedure. When this is done the mouth will open, whether the bands are divided or not, because of the leverage principle which has been described above.

The after-treatment consists of keeping the jaws separated, with the threaded wooden cone, two tongue depressors placed together between the front teeth and separated outside (New) or forcing the jaws apart with the index finger on the lower teeth and the thumb on the upper (Potts). These exercises must be practiced regularly and frequently for

certain periods each day and persisted in indefinitely. These passive exercises must be combined with active exercises, such as opening the mouth as widely as possible many times each day, and chewing gum. If the operation is carefully performed and the after-treatment properly carried out, good results are almost certain to follow. As I said before, arthroplasty on the jaw is one of the most satisfactory operations which is performed by the surgeon.

BIBLIOGRAPHY

1. Gray's Anatomy. 20th ed., p. 297.
2. Henderson and New. Ankylosis of the jaw. Surg., Gynec. & Obst., 1918, xxvii, 451–458.
3. Lyons, Chalmers J. Ankylosis of the jaws. J. Am. M. Ass., 1917, lxviii, 174–177.
4. Neff, James M. Arthroplasty. Surg., Gynec. & Obst., 1912, xv, 529–552.
5. Chubb, G. Ankylosis of the mandible and its operative treatment. Brit. M. J., 1920, Feb., p. 257.
6. New, G. B. Ankylosis of the jaw due to fixation of temporal muscle. J. Am. M. Ass., 1919, lxxiii, 264–265.
7. Thomson. Edinburgh M. J., 1917, xix, 176.
8. Vecchi, A. Traumatic ankylosis of the jaw. Gazz. d. osp., Milano, 1918, xxxix, 563.

FOCAL INFECTION AND ELECTIVE LOCALIZATION OF BACTERIA IN APPENDICITIS, ULCER OF THE STOMACH, CHOLECYSTITIS, AND PANCREATITIS[1]

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INFECTIONS in organs or tissues remote from the surface of the body, such as joints, bones, and endocardium, are conceded by all to be hæmatogenous in origin. The origin of disease in organs directly or indirectly connected with the surface of the body, such as the stomach, gall-bladder, pancreas, and appendix, is still considered by many to be due, in the main, to direct infection through the mucous membrane lining the intestinal tract or the ducts which drain into it. Many facts suggest that in these, too, the infection may be blood-born. The lesions in the early stages or milder forms of infection in these structures are often sharply circumscribed, hæmorrhagic, and situated in the mucosa, submucosa, or peritoneal coat, with no evidence of a diffuse involvement of the mucous membrane. The fact that the changes in pancreatitis are usually more marked in the head of the pancreas is quite generally considered evidence of an ascending infection through the ducts. But this does not follow since I have found that the same is true in pancreatitis from the intravenous injection of bacteria having affinity for this organ.

Experiments to produce ulcer of the stomach by feeding bacteria have been unsuccessful except in starving animals. In my (17) work ulcer of the stomach could not be produced even when streptococci, proved to produce ulcer on intravenous injection, were fed in larger quantities. The addition of sharp particles to the diet containing the streptococci was also of no avail.

Streptococci proved to have an affinity for the gall-bladder when injected intravenously failed to produce cholecystitis when injected directly into the lumen of the gall-bladder (18).

Intravenous injection of streptococci, and in some instances of colon bacilli, from acute appendicitis has been followed by marked localization and lesions of the appendix of rabbits (19), whereas attempts to produce appendicitis by way of the mucous membrane have been unsuccessful unless the blood supply is markedly interfered with.

From these facts and many others it is certain that the normal mucous membrane of the intestinal tract affords marked protection against invasion of the bacteria usually found in ulcer of the stomach, cholecystitis, and appendicitis. A break in continuity or increased permeability of the lining cells from trauma, or otherwise, appears necessary for local invasion, whereas in hæmatogenous in-

[1] Mayo Foundation Lecture, delivered February 11, 1921.

fections the bacteria appear to gain entrance into the blood stream chiefly through a chronic localized focus of infection.

The place of localization of bacteria after entrance into the blood stream, aside from the well known factor of trauma, or the *locus minoris resistentiæ*, has been considered as more or less accidental. Many facts indicate that this is not the rule and that delicately balanced conditions must prevail before localization and growth of bacteria can occur in a given tissue. The blood stream is invaded by the typhoid bacillus in typhoid fever, yet the lesions are limited to Peyer's patches and other lymphoid structures in the intestinal tract. The pneumococcus enters the blood in practically all cases of lobar pneumonia, yet localization remains limited to the lungs and pleura. The streptococcus viridans has been isolated from the blood daily for weeks and even months in chronic septic endocarditis, but localization remains limited to the endocardium. The lodgment of even millions of these streptococci, as occurs in emboli, from the vegetations is not sufficient to insure continued growth in tissue other than the heart valves.

In the infectious diseases the properties of specific micro-organisms determine their localization. The idea that localization may be determined by peculiar properties in different strains of the same species of bacteria, or of even the same strain when subjected to different conditions, had its origin in my experiments some years ago in which changes suggesting true mutations were induced in the pneumococcus-streptococcus group of organism (15). The idea was placed on substantial ground when the streptococcus viridans from endocarditis and other strains of streptococci of low virulency were passed successively through animals. The localization following intravenous injection changed as the infecting power increased. At first hæmorrhages in the heart valves and endocarditis were the chief findings. Later lesions in and around joints, in muscles, especially the tendinous end, and eyes, especially iritis, developed. Still later lesions of the kidneys and of the stomach developed, and finally, as the virulency became high, death occurred from invasion of the blood stream without focal lesions.

The findings in the stomach were particularly instructive (16). The hæmorrhages and ulcerations were found to be due to localized infection. The ulcers were often single and deep, and showed, as those in man, marked tendency to hæmorrhage and perforation. Generalized infection did not occur. The theory that the usual type of gastric ulcer may be due to streptococci was proposed at that time. The supposed relation between infected tonsils or teeth and gastric ulcer was, in the light of the experiments, considered to be due not to the swallowing of bacteria, as usually supposed, but to the entrance into the blood of streptococci of the proper kind of virulence to produce local infection in the wall of the stomach. It was through these experiments that the idea of the elective localization of bacteria took definite form, and I have since studied the pathogenesis of various diseases from this standpoint.

The cultures from excised tissues and from foci of infection have been made by special methods which offered a gradient of oxygen tension, a point not sufficiently considered by some workers along this line. The localizing powers of the freshly isolated strains of the bacteria isolated from the tissues, and, owing to the work of Billings on focal infection, those from the focus as well, have been measured by intravenous injection in animals. The results obtained have been published from time to time, and for details reference should be made to the original reports. In this paper I wish to review briefly the results obtained in the earlier work in ulcer of the stomach, cholecystitis, and appendicitis, diseases of especial interest to surgeons, and to record further studies along similar lines.

RESULTS IN THE EARLIER STUDIES

Streptococci were found to be the most important organism in the tissues in each of these diseases. They were chiefly of the non-hæmolytic type, of a low grade of virulence, and culturally much alike. Wide differences in inherent properties, however, became apparent on intravenous injection. The streptococci tended to localize and produce lesions

in organs corresponding to those in the diseased persons from whom they were isolated. This was true of the strains from tissues as well as of those from infected tonsils or other foci of infection. Thus 68 per cent of sixty-eight animals injected with fourteen strains from appendicitis developed hæmorrhagic lesions of the appendix (19); 60 per cent of 103 animals injected with eighteen strains from ulcer showed hæmorrhage and ulcer of the stomach (17); and 80 per cent of forty-one animals injected with twelve strains from cholecystitis developed lesions in the gall-bladder (18). This was in sharp contrast to the incidence of lesions in these organs (3 per cent, 17 per cent, and 4 per cent respectively) following injection of forty-four animals with thirty-four strains of streptococci from miscellaneous sources. The lesions which developed in the respective specific organs were not only more common, but were often more marked when lesions in other organs were slight or absent. Moreover, the strains from acute ulcer, cholecystitis, and especially appendicitis, produced lesions more marked than those from the chronic forms of these conditions.

The demonstration that streptococci in infected tonsils and teeth may have elective localizing power placed these so-called harmless infections, teeming with bacteria, in the front rank in importance as sources of hæmatogenous infections. Corroborative clinical evidence indicating causal relationship between the focus of infection and systemic disease is not lacking. The foci are present in demonstrable form in a high percentage of patients with the diseases under consideration. Acute attacks often follow exacerbations of infections in sinuses, tonsils, and teeth. Evans has noted a marked increase in the incidence of appendicitis during epidemics of sore throat. The average time that elapsed between the respiratory infection and the onset of appendicitis was sixteen days (5). The presence of streptococci having elective affinity for the appendix has been demonstrated in the tonsils at the time of acute appendicitis following tonsillitis, and their absence as recovery ensued (19). This I have shown also in cases of ulcer following acute infection in tonsils and sinuses (17), a fact in strict accord with the increased incidence of symptoms in ulcer during the months when these infections are prevalent, as first noted by Moynihan. Metastatic infection in other parts, such as the joints and the endocardium, commonly occur, not at the height of the nasal and tonsillar infection, but some time later. It appears that the bacteria acquire elective localizing power in the focus and that the various diseases may be manifestations of phases in the infecting power of the same micro-organism. The symptoms in the systemic condition often improve when foci of infection are removed unless mechanical factors have come to play an important part in their production. However, not too much value should be attached to purely clinical observations on this point. It is very difficult to know at a given time whether a suspected primary focus is responsible, whether other foci exist in inaccessible parts, whether a previous removal of a focus has been thorough, especially if in the dental area, whether the foci removed actually harbored the bacteria with which the disease could be reproduced, and finally whether in a given case, especially if chronic, the infection has not become so thoroughly established as to tend to progress independently of the focus.

My original experimental studies in ulcer (17), cholecystitis (18), and appendicitis (19), extended over a short period, and included a relatively small series of cases. The results were on the whole contrary to current opinion, especially in ulcer. Some investigators have had difficulty in corroborating my findings. The number of bacteria injected was relatively large and this has been objected to. I believed it worth while, therefore, to continue the studies in a larger and more varied series, including recurrent ulcer, and to test the effect of the injection of smaller doses of bacteria. This has been done as occasion developed during the past 5 years. The method of study has been similar to that in the earlier work. In all the cases the symptoms were active at the time of the study and in all there were foci in which a casual relationship was suspected. Painstaking effort was made to obtain cultures from the depths of the focus and to eliminate as far as possible the more

saprophytic bacteria on the surface. Glucose-brain broth in tall columns was substituted for ascites-glucose broth. The dose for a routine injection consisted of from 0.1 cubic centimeters to 0.25 cubic centimeters for each 100 grams of body weight. Usually only one injection was given. In order to rule out all possible objections to dosage, the small amount of pus expressed from tonsils and emulsions of tonsils was injected directly. The primary culture in glucose broth was usually injected and the identity of the causative organism determined by plating the culture, by making cultures of the tissues showing lesions, and by making control cultures of the blood and normal mucous membrane of the stomach and other organs showing no lesions.

RESULTS IN UNPUBLISHED EXPERIMENTS

In the series sixty-five animals (fifty-nine rabbits, four dogs, and two guinea pigs) were injected intravenously with the cultures from nineteen cases of ulcer of the stomach or of the duodenum. Thirty-two of these were injected with cultures from the tonsils, six with the bacteria in the pus from the tonsils, seven with the streptococci isolated from three excised ulcers, and twenty-three with the cultures from infected teeth. The incidence of lesions in the stomach and in the duodenum was about equally high in each of these groups. Hæmorrhage or ulcer, or both, developed in fifty-two (80 per cent) of the animals injected. The lesions in other organs were either wholly absent or relatively slight. Fifteen animals showed lesions in the gall-bladder beside those in the stomach, seven showed a few lesions in the skeletal muscles, five in the joints, one each in the kidney and the urinary bladder, and nine hæmorrhages in the heart valves. The lesions in the stomach consisted first of areas of hæmorrhage varying greatly in size and shape, and later of one or more ulcers. The ulcers were usually situated along the lesser curvature and the pyloric end. Ulceration usually occurred first in the center of the hæmorrhagic areas and extended to the submucosa or muscularis. In some instances the ulcer formed in circumscribed, grayish, swollen, necrotic areas free from hæmorrhage. The base at first was hæmorrhagic, but later became clean and free from necrotic tissue. Usually there was no infiltration or hyperæmia of the overlying peritoneum.

All the six animals injected with the bacteria which had grown in the tonsil developed striking lesions in the stomach or duodenum. Three of these did not have lesions elsewhere, and three had hæmorrhage of the tricuspid valve in addition, but no other lesions. Only four animals died from the effects of the injection, two in one day, and two in two days. The rest appeared well when anæsthetized, usually in from 2 to 3 days after the last injection. The streptococcus was found in the blood in all the animals that died, but it was found in only three of thirty-one that were anæsthetized and in which the blood was cultured. Cultures were made of the excised areas of hæmorrhage or ulcers in seventeen animals. Of these fifteen yielded the streptococcus, and two were sterile. Control cultures were made of the normal mucous membrane of the stomach, the liver, the spleen, the kidneys, and the brain in twelve animals showing ulcer. These and the blood were sterile or showed relatively few streptococci compared with the number isolated from the lesions in the stomach.

Since my last report on ulcer, tissue cultures have been made from twenty-seven chronic ulcers excised at operation. Streptococci were isolated in eighteen, colon bacilli in five, staphylococci in six, and six showed no growth. In all of the latter healing was well advanced. Control cultures were made of the tissues in carcinomatous ulcers from eleven patients. In these streptococci were found in only two, colon bacilli in five, and staphylococci and Welch bacilli in two each.

The history of ulcer symptoms in the cases studied ranged from 6 months to 21 years. The ages of the patients ranged from 27 to 53 years. All had active symptoms at the time of study, and two had had gastric hæmorrhages a short time previously. Only four had a history of attacks of tonsillitis; two of these had arthritis in addition to ulcer. In none were the tonsils acutely inflamed; most of them were small and contained a large

TABLE 1.—ELECTIVE LOCALIZATION OF STREPTOCOCCI IN ULCER OF THE STOMACH, CHOLECYSTITIS, AND APPENDICITIS

Source of streptococci	Strains	Animals	Percentage of animals showing lesions in														
			Eyes	Teeth	Skin	Muscles	Joints	Intestines	Appendix	Stomach and duodenum	Gall-bladder	Kidneys	Lungs	Pericardium	Myocardium	Endocardium	Nerves	Central nervous system
Ulcer of stomach	37	168	0	4	0	4	12	4	1	68	21	3	0	2	3	10	0	?
Cholecystitis	12	41	0	0	2	7	17	17	0	29	80	5	5	0	2	10	0	?
Appendicitis	17	71	0	0	0	12	29	9	70	11	1	0	0	0	9	21	0	?
Myositis	24	159	0	7	3	75	31	0	0	15	2	11	7	6	14	11	11	?
Acute poliomyelitis	22	123	0	2	0	16	15	5	2	13	2	2	11	5	7	7	4	46
Miscellaneous	71	212	4	3	4	12	9	4	1	9	1	9	7	0	4	12	4	?

pocket at the pole from which pus could be expressed. The cultures from dental foci were chiefly from infected areas in the apical region of devitalized teeth. The size of the areas of rarefaction around the teeth varied greatly. In some it was slight, in others marked. All were symptomless. In no instance did these areas contain visible pus, and none communicated with the surface through a sinus. Tonsillectomy was advised and performed in four cases because of the striking localization of the streptococci in the stomach of the animals. Improvement in ulcer symptoms followed in each patient. In three cases elective localization occurred with streptococci both from the tonsils and the teeth, and in two with the streptococcus from the tonsils and from the ulcer. No localization followed intravenous injection of the streptococcus from the focus in two cases, nor from the excised ulcer in one case.

SUMMARY OF RESULTS IN ILLUSTRATIVE CASES

There were two cases of ulcer in the series in which the cultures had affinity for the mucous membrane of the stomach and for the mucous membrane of the gall-bladder. The relatively high incidence (21 per cent) of lesions in the gall-bladder, shown in Table 1, is due in large part to these two cases. In one of these a chronic indurated ulcer of the lesser curvature of the stomach was excised, and a distinctly thickened and hyperæmic gall-bladder, with swollen glands, was found. The patient made a good recovery from ulcer symptoms, but subsequently developed typical attacks of cholecystitis. The streptococcus from the tonsil was isolated, and after one and two animal passages was injected into six animals —five rabbits and one dog. Marked lesions in the stomach or duodenum developed in all, and two showed lesions of the gall-bladder in addition. The other case had a perforating ulcer of the duodenum without evident lesions of the gall-bladder. The streptococcus from the tonsils was injected into nineteen animals. Fifteen received a pure culture in the first, second, and third animal passages, two a mixture of the streptococcus and colon bacillus in the primary culture from the tonsils, and two the mixture of bacteria in the pus directly from the tonsils. Fourteen (74 per cent) showed hæmorrhages or ulcer of the stomach or duodenum, nine showed lesions of the gall-bladder in addition, and four showed cholecystitis only. The lesions in other organs were few. Two showed hæmorrhages in the heart valves, one slight arthritis, and one a few lesions of the kidneys.

Five rabbits were injected with the colon bacillus in the second and third animal passages. All developed cholecystitis, and three slight hæmorrhages in the stomach or in the stomach and duodenum. One additional rabbit injected with the strain in the fourth passage died of overwhelming infection without developing focal lesions anywhere.

Localization in the stomach and duodenum was in general the striking picture following the injection of the streptococcus. The lesions in the gall-bladder were relatively slight and consisted usually of localized necrotic areas surrounded by hyperæmia and infiltration, but marked diffuse œdema with fibrinous exudate did not occur following injection of the streptococcus alone. Following the injection of the colon bacillus the picture was reversed. The lesions in the stomach were slight, while those in the gall-bladder were marked. The most marked lesions in the gall-bladder, however, occurred when a mixture of the streptococcus and colon bacillus was injected.

We have had the rare opportunity to study the elective localizing power of the bacteria from infected teeth in a man who had recurring attacks of ulcer with hæmorrhage, and on whom a gastro-enterostomy had been performed 12 years before. No attention was paid to the question of foci of infection at that time. After the surgical removal of five infected teeth the patient's symptoms gradually disappeared under medical management, although heretofore his condition had been refractory to this treatment. The streptococci from the granulomata of three teeth and from one devitalized tooth which showed no granuloma were injected into four rabbits. The animals appeared well 48 hours later, when anæsthetized. All showed hæmorrhages and ulcer of the stomach. The ulcers were situated along the lesser curvature and in the pylorus. Three of the four rabbits showed hæmorrhage and œdema opposite the roots of the lower incisors. No other lesions had developed.

The results of the animal experiments performed in connection with a patient having symptoms of chronic cholecystitis without stone, and chronic pancreatitis with achlorhydria, representing the type described by W. J. Mayo, emphasize still further the importance of studies of focal infection and elective localization. This patient complained of distress after eating, repeated attacks of moderately severe pain in the regions of the gall-bladder and pancreas, of recurring attacks of diarrhœa, and marked loss in weight (60 pounds). A general examination was negative except for slight tenderness in the right hypochondrium. Two devitalized abscessed teeth were found and removed, and one abscess in the upper jaw where a tooth had been extracted years before was drained. The patient continued to lose weight. Six months later the tonsils were removed. Following tonsillectomy the patient regained health and most of her former weight.

The primary culture from the tonsil was injected into one rabbit and three dogs. One of the dogs died in 24 hours; the other two and the rabbit were chloroformed in 48 hours. The picture was most striking. All four animals showed lesions of gall-bladder, pancreas, and stomach. The gall-bladder and pancreas were hæmorrhagic and œdematous. The lesions in the pancreas were more marked in the head. The stomach appeared very different from stomachs following injection of the ulcer strains. The acid-secreting portion of each was extremely hyperæmic and showed numerous fine superficial hæmorrhages, while the pyloric end was normal. The streptococcus isolated from the œdematous fluid surrounding the pancreas in one of the dogs was then injected into a dog and into a pregnant cat. Marked lesions of the gall-bladder and pancreas developed in both, but the stomach in each was spared. The cat aborted and the one nearly full-grown fœtus available for examination showed hæmorrhagic fluid in the peritoneal cavity, and marked œdema and small hæmorrhages of the pancreas. Cultures from the lesions in the pancreas of the fœtus, of the pancreas and gall-bladder in the mother cat, and of the pancreas and gall-bladder in the dog yielded the streptococcus injected.

About 1 year after tonsillectomy the patient again began to lose weight and strength. At this time three encapsulated roots of teeth were found and removed surgically. Cultures of two yielded green-producing streptococci; the other was sterile. Injection again showed similar localizing power, and with the removal of these foci the patient again improved.

During the course of the 5 years careful necropsy records have been kept of the lesions

found after intravenous injection of cultures from tonsils, and so forth, in diseases other than ulcer in which elective localization was not obtained, as well as in normal individuals. These have been compiled to serve as control experiments. Of a total of 212 animals injected with seventy-one strains only twenty (9 per cent) revealed significant hæmorrhages or ulcer of the stomach or duodenum. This low incidence was not due to a lower general virulence of the streptococci injected, because in this series the total mortality was nearly five times as high as in the ulcer series. The incidence of lesions in organs other than those in the stomach or duodenum was higher and occurred in a larger number of different organs. The muscles, joints, and kidneys ranked highest, the incidence being 12 per cent, 9 per cent, and 9 per cent respectively (Table 1).

Among the diseases studied in the miscellaneous group were acute myelogenous leukæmia, urticaria, ulcerative colitis, bronchitis, elephantiasis, thyroiditis, diabetes, purpura, jaundice, epididymitis, acute pyorrhea, dermatitis, and angina pectoris. Many of the cultures injected were obtained from tonsils or teeth of persons who were well at the time of the experiments. Moreover, an additional check on these experiments is given by the low incidence of lesions in the stomach and duodenum following injection of streptococci from other diseases in which elective localization was demonstrated. Thus lesions in the stomach and in the duodenum developed in only 13 per cent of 123 animals injected with cultures from twenty-two cases of acute epidemic poliomyelitis, in 6 per cent of eighteen animals injected with cultures from the tonsils in four cases of neuralgia, and in 14 per cent of 159 animals injected with streptococci from twenty-four cases of myositis (Table 1).

In Table 1 is given a complete summary of the localization of streptococci obtained from ulcer, cholecystitis, and appendicitis, and, as controls, localization of streptococci from myositis, from acute poliomyelitis, and from miscellaneous sources. The incidence of lesions in the various organs is given in percentages so that the figures are directly comparable.

DISCUSSION AND SUMMARY

In view of the large number of animals injected and the wide range of the source of the streptococci, the incidence of lesions in the various organs following injection of nonspecific strains may be considered an expression of their relative susceptibility to infection. It will be noted in this series, as in my former studies, that lesions in the joints, the muscles, the stomach and duodenum, and the endocardium rank highest, which corresponds in general to the frequent occurrence of spontaneous infections in these structures in man and animals.

The occurrence of lesions in the gall-bladder and in the pancreas of animals following injection of bacteria from the case of suspected cholecystitis without stone and with pancreatitis, and the relatively high incidence (21 per cent) of lesions in the gall-bladder following injection of the ulcer strains, and in the stomach and duodenum (29 per cent) following injection of the gall-bladder strains, suggests that the common association of two or more of these conditions in man may also be due to embolic infection by bacteria having affinity for the structures involved.

The demonstration that the foci of infection in tonsils and teeth, so commonly noted in patients with ulcer of the stomach, cholecystitis, pancreatitis, or appendicitis, contain bacteria which reproduce these respective diseases in animals, suggests strongly that such foci must be important factors in the production of these conditions in man. A focus of infection that is teeming with micro-organisms, wherever found, it may be in the intestinal tract, which for mechanical reasons can neither heal nor drain, should be regarded as a test tube with permeable walls embedded in the tissues. In consequence the continued growth of the living bacteria and their products ultimately tends to overwhelm the protective mechanism of the host.

The careful elimination of foci of infection should become a routine procedure in both the medical and surgical management of these diseases. The focus should be removed before the mechanical factors, such as much scar tissue in chronic ulcer, gall-stones in

cholecystitis, and fæcal concretions or kinks from adhesions in appendicitis, have come to play a dominant part. The benefits should be especially noticeable in preventing acute attacks, in diminishing the number and severity of exacerbations in the chronic conditions, and in reducing the incidence of gastrojejunal ulcer after gastro-enterostomy, as emphasized by Eusterman and by Judd. The elimination of visible foci, however, will not prevent all these infections. The invasive power of the bacteria may be so great in some instances that forced entrance, as occurs in a focus, is not essential, and entrance may be gained through the unabraded mucous membrane as in acute infectious diseases.

In the light of these experiments the place of localization after entrance into the blood stream depends largely on the peculiar infecting powers of the bacteria themselves. The fact that the peculiar infecting powers of the streptococci are lost on artificial cultivation, as well as on animal passage, would indicate that the strains isolated in these diseases are not specific, but modifications of the same strain. The reasons for the common presence in these diseases of organisms with respective elective localizing powers, again demonstrated in this study, are still obscure.

The elective localizing power of the colon bacillus has been demonstrated in cholecystitis and appendicitis, but only rarely. The results of the cultures of the tissues removed at operation and of the animal experiments indicate strongly that the colon bacillus is usually a secondary although important invader, especially in acute cholecystitis and appendicitis, and that it plays only a minor part in the etiology of ulcer of the stomach.

The results of my former studies have been corroborated and extended (2, 3, 6, 7, 8, 12, 14). The production by Mann of a specific cholecystitis by the intravenous injection of Dakin's solution supports the idea of elective localization from the chemical standpoint. The criticism of the size of the dose injected in my previous work has been met; the small number of bacteria from foci injected directly has been followed by elective localization. Streptococci have been found most constantly in the infected tissues and foci of infection in each of these diseases. They were usually the only organisms that had elective localizing power. With them the diseases, including ulcer, have been reproduced in animals. They have been repeatedly isolated from experimental lesions and the diseases again reproduced. The requirements for causal relationship of parasite and disease appear to be fulfilled. The conclusion that streptococci are the chief cause of ulcer of the stomach, cholecystitis, and appendicitis, and, probably, pancreatitis, seems to be justified.

I wish here to express my appreciation to members of the staff of the Mayo Clinic through whom this work was made possible.

BIBLIOGRAPHY

1. Billings, F. Chronic focal infections and their etiologic relations to arthritis and nephritis. Arch. Int. Med., 1912, ix, 484-498.
2. Brown, R. O. A study on the etiology of cholecystitis and its production by the injection of streptococci. Arch. Int. Med., 1919, xxiii, 185-189.
3. Detweiler and Maitland. The localization of streptococcus viridans. J. Exp. Med., 1918, xxvii, 37-47.
4. Eusterman, G. B. A clinical study of eighty-three gastrojejunal ulcers. Minn. Med., 1920, iii, 517-524.
5. Evans, J. S. Epidemiology of acute appendicitis. Wisconsin M. J., 1918, xvii, 91-93.
6. Gerdine, L., and Helmholz, H. F. Duodenal ulcer in infancy, an infectious disease. Am. J. Dis. Child., 1915, x, 397-409.
7. Hardt, L. L. J. Contributions to the physiology of the stomach. Am. J. Physiol., 1916, xl, 314-331.
8. Irons, E. E., Brown, E. V. L., and Nadler, W. H. The localization of streptococci in the eye. J. Infect. Dis., 1916, xviii, 315-334.
9. Judd, E. S. Jejunal ulcer. In press.
10. Mann, F. C. Production by chemical means of specific cholecystitis. Ann. Surg., 1921, lxxiii, 54-57.
11. Mayo, W. J. Cholecystitis without stones or jaundice in its relation to chronic pancreatitis. Am. J. Med. Sc., 1914, cxlvii, 469-474.
12. Moody, A. M. Lesions in rabbits produced by streptococci from chronic alveolar abscesses. J. Infect. Dis., 1916, xix, 515-525.
13. Moynihan, B. G. A. Duodenal Ulcer. 1910, 106, 251.
14. Oftedal, S. Elective localization, in the bronchial musculature, of streptococci. J. Am. M. Ass., 1916, lxvi, 1693-1694.
15. Rosenow, E. C. Transmutations within the streptococcus-pneumococcus group. J. Infect. Dis., 1914, xiv, 1-32.
16. Idem. Production of ulcer of stomach by injection of streptococci. J. Am. M. Ass., 1913, lxi, 1947-1950.
17. Idem. The causation of gastric and duodenal ulcer by streptococci. J. Infect. Dis., 1916, xix, 333-362.
18. Idem. The etiology of cholecystitis and gall-stones and their production by the intravenous injection of bacteria. J. Infect. Dis., 1916, xix, 527-556.
19. Idem. The bacteriology of appendicitis and its production by intravenous injection of streptococci and colon bacilli. J. Infect. Dis., 1915, xvi, 240-268.

AN ESTIMATE OF THE VALUE OF LOCAL ANÆSTHESIA IN THE SURGERY OF TODAY[1]

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OUR Association exerts a widespread influence in molding medical opinion, hence this appeal for you to champion a cause to which several of our Fellows have made notable contributions. This matter forces itself upon our attention since a survey of the busy clinics indicates that a few authorities go to one extreme or the other in the matter of local anæsthesia, that some unite on the rational viewpoint of it having a certain, definite field of usefulness, while many consider it not at all.

We shall concern ourselves today largely with a recital of the impressions which have been gained by many years' observation of a large number of patients before, during, and after the employment of local anæsthesia of one sort or another, confining the discussion to methods that are highly practical, thoroughly safe, fairly easily acquired, and a part of the daily routine in my own clinic. This should then resolve itself into an intimate consideration of how and why we use local anæsthesia, together with a summary of our results. I may state that it has been written in part by the patients themselves, dealing as it does with their impressions which, indeed, are often expressed in their own words.

No more than passing reference will be made to the age-old use of cold, pressure, constriction, and other procedures for the production of local anæsthesia. They were rendered obsolete when two discoveries of the first magnitude made the infiltration technique possible, viz., invention of the hypodermic syringe by Wood, in 1853, and injection by von Anrup, in 1879, of cocaine under the skin of his arm, followed by the development of an anæsthetic area. It remained, however, for the American, Corning, to have the distinction of being the first to make a clinical application of this knowledge to surgery.

One needs no more than mention that there are six methods of employing the local anæsthetic agents of today, (1) direct infiltration of the field; (2) circular infiltration about the field; (3) nerve blocking, in which the agent is injected directly around or into an isolated nerve; (4) intravenous injection; (5) arterial injection, and (6) surface application.

For the purpose of general surgery, we may well confine our attention to the first three procedures, since the intravenous method has a narrow field, the arterial is attended by obvious disadvantages, and surface anæsthesia is used only in the limited surgical specialties.

PSYCHOLOGICAL CONSIDERATIONS

I am indebted to Professor Swift of Washington University for his assistance in interpreting some of the interesting psychological aspects of the local anæsthesia problem. One who studies the subject from this point of view early notes that there is in different patients a marked individual difference in receptivity to pain stimuli, which is largely influenced by race, nationality, sex, age, intelligence, character, training, state of health, fatigue, and surrounding influences. Nor is it pain alone which we have to control; our problem is, at the same time, to combat the anticipation of pain and the age-old fear of pain. Our problem should then be undertaken before the sufferer enters the operating room proper, and has to do not only with the patient, but with the patient's point of view. We might even go farther back than this and safely make the statement that public appreciation of local anæsthesia is secondary in importance only to the intrinsic value of the procedure itself. Only in this way can it come about then that many an individual may be influenced to have a needed operation done after being long held back by the dread of a general anæsthesia. This is, I think, particularly true of patients who come to the surgeon for the second time after once having had a general narcosis, a fact which is especi-

[1] President's address read before the Southern Surgical Association at Hot Springs, Virginia, December, 15, 1920.

ally impressed upon one by the individual whose first convalescence has been unsatisfactory to him. I have in mind now a gentleman whose sigmoid we resected for cancer, under ether; he experienced pneumonia, empyema, thrombophlebitis, and a postoperative hernia in consequence. It was many months before this patient returned to his accustomed health, and then, as may be easily imagined, he never considered a repair of his incisional hernia until told that this could be readily accomplished without a general anæsthesia

A wonderfully steadying effect is exerted upon a prospective local anæsthesia patient by allowing him to talk with one who has experienced this form of treatment. In most instances, this does more than anything else known to me to inspire confidence in the method. An expression of the same idea impressed me recently, when a father desired his son to witness the performance of a double herniotomy under infiltration, his reason for this unusual request being that the younger man also needed a herniotomy, but had withheld consent because he was afraid of an anæsthetic. I am inclined to think that the greatest good to the greatest number might be accomplished under such circumstances by relaxing the ordinary operating-room rules in as far as they apply to visitors.

A patient who has gone through one operation under local anæsthesia, is in my experience, more amenable to a second undertaking of the same character, than is the individual who has once been under ether. I recall to memory just now a prominent attorney who had taken ether years before I saw him. Then I repaired a right-sided inguinal hernia for him, under infiltration. About one year later, after indulging in athletics of unusual violence, he returned to me with a hernia on the left side. He made light of the prospect of a third operation, because, as he said, he did not now have to take ether; surely he should have been in a position to judge because he had had experience with both the general and the local methods.

In their opposition to a general anæsthesia, many patients reason that a drug which renders them unconscious is a highly potent agent which might conceivably interfere with the truly vital functions, and surely one cannot be blamed for considering seriously any such profound alteration in the course of his ordinary existence. It does not require much of a psychologist to reason that one who enters a state of somnolence so deep that pain cannot affect him may conceivably never awaken again; however, it remains for the surgeon to balance the relative risks of the two procedures against one another, but the ideal solution of the problem may be said to exist when the view-point of the patient coincides with that of his medical adviser.

The psychological tendencies of people differ in the matter of remaining awake on the operating table. One may say: "I do not want to know anything about the procedure; I know I shall not be hurt, but I cannot bear the thought of being awake in an operating-room and of being cut." On the other hand, another may say: "I do not wish to lose consciousness for a single moment. I want to know what is going on, even at the expense of some pain." The surgeon, who is a student of psychology, humors the natural tendencies of either type of patient; it is a very good plan in many instances not to bring up a discussion of an anæsthesia until the operating room has been reached, unless the patient has demanded a consideration of this matter beforehand. A reasonable individual has so much confidence in the surgeon selected that he is likely to co-operate in whatever is suggested, hence there is no special reason for burdening him with details which he often cannot clearly comprehend and which may merely cause him uncertainty and worry. Again, it sometimes does very little good to map out a definite and inelastic plan, since one cannot foretell how even a willing patient will react under local anæsthesia until the operation has commenced. Here, as elsewhere in medicine, every patient is to some extent a law unto himself and demands individual treatment.

CONSIDERATION OF THE DRUGS EMPLOYED

Paul Ehrlich named the drugs which produced local anæsthesia "anæsthesiphores," according to the grouping of their atoms.

The anatomical grouping of cocaine was first determined, then reproduced synthetically, and the newer local agents, such as novocaine, were the result of further study along the same line.

It is pretty generally admitted that such an agent to be acceptable must fulfill certain, necessary requirements: it is to be soluble in water; it must stand boiling; it must combine with adrenalin; it cannot be more than mildly toxic, cannot be irritating during injection, nor must it produce permanent injury to the tissues.

All the chemicals in this group work in very much the same way, but some of them are highly irritating for the moment, others produce a transient effect, some like cocaine are highly toxic, and others exert considerable tissue damage. Local agents act as anæsthetics because they are soluble in the lipoids of the peripheral nerves, and most experimenters consider their action to be physical rather than along chemical lines. These agents have a special affinity for sensory nerves, affecting them earlier and much more profoundly, and for a longer time than they do the motor variety. This selective action may quite well be due to the fact that in mixed nerves at least the sensory fibers are said to run on the outside of the nerve bundles.

All of these local agents in addition to being protoplasm poison, are at the same time toxic in the general sense by their effect on medullary centers; they are dangerous in proportion to the dose used and to the rapidity of absorption. Their general toxicity is inhibited on the other hand by many things which retard absorption, viz., cold, constriction, or the admixture of adrenalin. The respiratory center in the medulla is the first to suffer and the one most deeply affected, hence prolonged artificial respiration may in some instances be the means of saving life.

Exhaustive experiments have shown that novocaine, now produced in this country under the name of procaine, better than any other drug fulfills all the requirements mentioned. It is only one-tenth to one-fifth as toxic as cocaine, according to the animals on which we have experimented. It is non-irritating and produces absolutely no tissue damage. It can, however, be used in quantities large enough to cause death, as we have frequently demonstrated on animals, respiration ceasing long before the heart stops beating. Six ounces of ½ per cent solution of novocaine, poured into the peritoneal cavity of a 15-pound dog, caused death from respiratory failure in about 20 minutes. Naturally enough, a drug which conceivably produces death may surely be said to exert a general effect when used as a local anæsthetic. I think this is frequently observed in our surgical clinics when comparatively large amounts of the drug are used. We have, however, used 8, 10, 12, and in a few instances, 16 ounces (500 to 1,000 cubic centimeters) of a ½ per cent infiltration solution, without observing serious toxic consequences. Of course, a very large amount, if used at all, must be injected over a considerable period of time and absorption delayed by adrenalin.

I may state in passing that very little difference has been observed in our clinic between the effects of one-half and one-fourth per cent novocaine in infiltration, although this runs counter to the experiments of most operators. I find, too, that the effect of novocaine in ½ per cent solution lasts no longer than 2 to 4 minutes unless adrenalin has been added; however, others, whose opinions I value, differ with me on this point. The use of adrenalin, on the other hand, greatly lengthens the effect of a ½ per cent infiltration. In one instance I infiltrated the anterior of the neck for a thyroidectomy, then was delayed by a surgical emergency from beginning the operation, and when finally the skin suture was finished 2 hours and 20 minutes after the injection of the neck, the anæsthesia was still practically perfect. It is hardly fair to dismiss this phase of the subject without mentioning at least that tissue changes, which have been blamed upon local agents, have to my definite knowledge been due to the fact that isotonic solutions were not used. It goes without saying, then, that novocaine or any similar agent is to be dissolved in physiological salt solution rather than in sterile water.

EFFECT ON DIFFERENT TISSUES

All who have investigated the response of the different tissues to pain stimuli agree pretty well that the skin is much more sensitive than are the other structures of the body. This is particularly true of the finger tips, and least so of the skin of the back, other areas approaching one or the other extreme in about the proportion that they are commonly exposed to pain stimuli. Muscle sheaths are highly sensitive and must be treated accordingly. Muscle and fat, on the other hand, are much less so, and may be handled with a certain degree of impunity, unless a vein or a nerve be encountered. Periosteum is acutely sensitive on areas which lie superficially beneath the skin, but less so in other parts of the body. The nerve supply of bone comes from the periosteum, hence bone sensation is largely dependent upon the treatment of the periosteum; indeed, bone is said to be practically anæsthetic if the periosteum has been removed.

Inflammatory affections of all tissues make them just as acutely sensitive to the injection of local agents as they are to all other forms of stimulation. Œdema, on the other hand, is generally thought to decrease tissue sensibility.

THE ADVANTAGES OF LOCAL ANÆSTHESIA

It is difficult to summarize in a logical manner the advantages of this method, since the needs of each patient are so highly individual, but one may sketch them in a general way. Not the least of them is the cooperation of the patient which we must secure at every stage of a procedure under properly conducted local anæsthesia. This is especially valuable in demonstrating the voice during thyroidectomy, in finding the sac of a hernia, or in coapting the edges of an abdominal incision which would be hard to close under ordinary circumstances. One may be practically sure, if his technique be correct, that he creates no immediate danger to life but escapes the possibility of a death on the table—the most shocking circumstance possible in connection with a surgical operation, for the fear of death on the operating table is more likely than anything else to deter patients from entering the operating room. With local anæsthesia, we greatly lessen the danger of operative shock, since, when we operate with any form of local anæsthesia, we do so with all centripetal stimuli cut off from the cerebral centers, something which is, as Crile has so well shown, not true with general anæsthesia alone. A refining influence is also exerted upon the operator's technique, since crude, rough work cannot be done without a general anæsthetic. We also greatly reduce the mortality of surgery, by decreasing the likelihood of postoperative complications, which may prove fatal, such as pneumonia, organic parenchymatous degenerations, etc.

No necessary detail of a multiple operation has to be omitted, since there is not the risk which attends a prolonged ether anæsthesia, having in mind, of course, a due regard for the patient's state of fatigue, which can be minimized by the use of morphine, during a lengthy procedure.

There are none of the immediate complications which so frequently are noted just after the patient regains consciousness, such as restlessness, sweating, mucus in the bronchial tree, nausea, sore jaw or tongue, and conjunctivitis, the last three due to manual carelessness of an anæsthetist. Then, we do not see the same amount of postoperative pain after local as after general anæsthesias, due no doubt to the patient's undiminished ability to endure it. However, I must not dwell too strongly upon this comparison, since there is some reaction after a cutting operation, no matter what form of anæsthesia may be used.

Some may urge, in criticism of the method, that it requires special training, that a surgeon must be particularly skillful and gentle to use it, and that all local anæsthesias are not quite equally successful, that it is somewhat time consuming and that it is not equally adapted to all procedures. These are all criticisms which reflect lack of experience or of refinement on the part of the one making them, and I believe they are heard less frequently as knowledge of the subject becomes more and more widespread.

INDICATIONS FOR LOCAL ANÆSTHESIA

The indication for local anæsthesia is far from universal. It depends first of all upon the ability and inclination of the surgeon, to say nothing of the condition and attitude of the patient, as well as his age, race, training, and intelligence, all of which must be taken into consideration. Local anæsthesia may be reasonably considered indicated in obstructive conditions of the air passages, inflammatory respiratory trouble, circulatory decompensation, acute abdominal emergencies, renal insufficiency, toxic conditions (goiter, etc.), chronic alcoholism, marked obesity, and in very old age. The same is true if a general anæsthesia has been used in the very recent past, and if the patient must for any reason become ambulatory immediately after the operation. Many consider local infiltration anæsthesia especially indicated in fractures and dislocations, arguing that a patient who is awake can co-operate with a surgeon in applying splints and preserving the contour of plaster until it is dry. In a simple fracture, the tissue bag thus created is filled with one-half per cent novocaine and the muscles are completely relaxed in consequemce, while it is claimed for a dislocation that the rent in a capsule full of fluid is much more easily found than that in one that is empty, as ordinarily seen.

CONTRA-INDICATIONS

There are a few definite contra-indications, in my opinion, to the use of local anæsthesia. Perhaps with increasing experience and more study of the subject, some or all of them may be modified or removed. However, at the present time, I do not believe that any form of local anæsthesia is advantageous with patients at an age when they cannot co-operate with the surgeon, still, I am perfectly aware that some men, experienced in this line, following Farr's example, operate on very young children with satisfaction.

I believe local anæsthesia to be contra-indicated in a case where the patient has an unreasoning fear of it, or in one who manifests unwavering opposition to it, or in one whose nervous system is not under fair control. It may be used in these classes of patients with good results however, if it is masked by gas or by a very light ether anæsthesia. This is really a phase of the subject which cannot be taken too seriously, since a lack of co-operation from a refractory patient has prevented us more than once from getting the local agent into the desired region, with a correspondingly imperfect anæsthesia as a result.

In May, 1920, a young man applied to me for a herniotomy under local anæsthesia, but after he had fainted during a physical examination, which was not in the least exacting, he of his own accord very wisely suggested the substitution of ether. This was done and I think would have been done by almost any surgeon who considers the patient's psychological aspect. Still I cannot dismiss this phase of the subject without mentioning that a large dose of morphine given just previous to the injection, frequently takes away the patient's interest in the procedure, without inducing toxic symptoms, and thereby negates his being temperamentally unsuited to local anæsthesia. It is also a question in my mind whether one should ever depend upon it alone for the performance of an operation which goes far beyond the ordinary time limits.

MORPHINE

The margin of safety of morphine and similar drugs is so small that they are never indicated for their general anæsthetic effect. The patient possessing a stable nervous equilibrum does not actually need any sedative if the local anæsthesias be perfectly conducted; however, the delicately balanced individual will gain much comfort from it. The operator must always bear in mind, however, its marked tendency to cause vomiting at most unlooked for and unwished for moments.

We have, in many instances, introduced morphine with the infiltration solution, since during the subsequent operation it exerts its influence at the time it is most needed if employed in this way. Probably too, its toxic influence is lessened because it is more slowly absorbed when used in combination with adrenalin, just as has been shown to be true of novocaine itself.

The dosage of morphine varies greatly with the age and condition of the patient. One-half to one grain is tolerated without undue symptoms by a gall-bladder patient who has had the drug used in many of her attacks. On the other hand, a very small dose may be more than a young child can tolerate without damage. An extreme tolerance is exhibited by patients afflicted with exophthalmic goiter, due I am sure to their rapid oxidation of it. I have used as high as 2 grains at a dose in one such sufferer, who did not even go to sleep nor vomit, although a relatively small dose, viz., 1 grain had acted as an irritant on a previous occasion and caused nausea and vomiting. It requires considerable temerity to mention such doses, and I surely do not wish to be placed in the position of advising them as a routine, still, it goes to show that the subject of morphine dosage offers food for thought. It may be well to remark here that morphine should never be used with local anæsthesia on an ambulatory patient, since it is likely to have a much more temporary debilitating influence than is the local anæsthesia or the minor operation itself.

When, during the progress of an operation, symptoms of approaching morphine intoxication present themselves, as has occasionally happened, we are in the habit of allowing the patient to drink one or more cups of strong, black coffee on the operating table. I am inclined to think that this may have prevented an embarrassing situation in more than one instance.

THE TECHNIQUE

In general, there is a great deal more to the technique of local anæsthesia than the mere knowledge of how, when, and where to inject. The general care of the patient's psychologic side in the operating room is scarcely second in importance to the local manipulation. It will occur to any one thinking along this line, that none of us possesses the maximum of courage and patience when enduring the pangs of hunger, hence it long ago became customary in our clinic to give the patient his breakfast as usual on the day of operation, provided, of course, no general anæsthesia was to be used.

Mental control should always be attempted by trying to secure the patient's attention, and then engaging him in a discussion of one of his leading interests. These are not usually difficult to ascertain, and in this way the sympathy of the individual is enlisted, also his co-operation often gained. The person who is inclined to balk at the injection may often be rendered amenable to suggestion by the presence of a sympathetic anæsthetist, also by the sight of a gas or ether apparatus, which he is assured is at his command. It is surprising to note how often this little ruse will work; very rarely, however, will the patient take advantage of the opportunity of getting a general anæsthetic, provided the local has been well managed. This line of reasoning has been carried a bit further in certain instances by allowing the patient, after novocaine has been injected, to get the faint *odor* of ether throughout the operation. The satisfied individual will often not differentiate sharply between the odor of ether and an ether anæsthesia, provided, of course, that morphine has been used and the infiltration been adequately made.

Local anæsthesia patients are not to be used as clinic material. Their status can be rendered satisfactory only in a room which is quiet and can on occasion be isolated. There are sensitive individuals who should be blindfolded and have the ears plugged before anything is done, thus guarding the special senses against insult. With each of the sensory nerves guarded against pain stimuli and the mental apparatus protected by morphine the injection may be made anywhere successfully, with the patient interested in music, conversation, the telephone, or reading a book. We often do it in the operating room, if no spectators are present, but our more sensitive patients have this done in bed and are not transported upstairs until they have regained a wanted composure. One should, as a matter of course, never take a patient to the operating room for a form of injection, such as nerve blocking, which necessitates a long wait between the injection and the operation.

I have no doubt, that, for making these injections, we shall some day have special

rooms, decorated appropriately and lending every facility for attracting the sufferer's attention as desired. One who has not done this work may be surprised to know that nothing proves more diverting during infiltration or operation than a few puffs on a cigar or cigarette, a distinct solace to any man who is addicted to the use of nicotine. By the same rule, a drinker must have his normal dose of alcohol before going to the operating room, and I have frequently given him more during the progress of the infiltration or subsequent operation, with excellent effect. Alcohol will for any of us relieve the tedium of any long-seeming experience, such as the stay in an operating room proves to be. The electric fan is one of our valued aids when sympathetic control begins to let go during a tedious procedure; indeed, every patient finds it grateful and most of them will immediately complain if a careless assistant walks between him and the fan.

The injection of itself is by no means the most disagreeable feature of the whole procedure, if gently and properly done, but it is a hard table, an uncomfortable posture, or fatigue that have most to do with wearing out the individual's patience. With this in mind, no really expert manipulator will closely confine the patient until it becomes absolutely necessary to do so, and then will release him at the earliest possible moment. In order to prevent any wait on the table between the injection and the operation, it is a good plan to have all draping of the patient and other preparation of the field done before the infiltration begins. If one employs a nerve block or other form of anæsthesia, requiring an interval of delay before the effect is secured, the initial stage of the procedure should take place before the individual is put on the operating table. It is often an excellent idea after the incision to keep him informed of one's progress, then if he happens to be acutely attentive during the operation, a display of the specimen may interest him to the extent that he will be content during a time-consuming closure, or some other unavoidable but essential formality.

It may not be amiss to deal for a moment with some of the causes of failure in the use of local anæsthesia. In many instances, of course, this is simply a matter of not having the proper solution injected into the right place. On the other hand, the solution may be all right, the injection properly done, and still one of the psychic phases of the subject may be so mishandled as to negate the result.

There are many ways in which the fluid may be improperly prepared. It must not be too old; it must not have been boiled more than once; the adrenalin must not be forgotten and it must never be boiled; also the adrenalin is decomposed if it is added while the solution is very hot; physiological saline must be used as a base for the solution, and the water of which it is made must have been freshly distilled for reasons which are perfectly well known.

It is well before beginning any infiltration to scratch very lightly the intended line of incision. As a result of experience one easily acquires the ability to make a more or less faint red line without scratching deeply enough to cause pain. If one infiltrates a well-marked area it is hardly possible to transgress its limits later and cut, prick, or retract tissues which have their normal sensibility. Many of the operators employ one or more wheals for the introduction of the large needle; I prefer to frost a skin area with Kelene spray, then lift up a furrow and pierce the skin at exactly right angles to its surface with the deep injection needle at once, thus sparing the patient the making of painful wheals.

The length and size of the needle should vary with the work at hand, details of which are readily found in all the works on local anæsthesia. I shall state in passing that the hypodermic syringe and needles have no place in this work because they are entirely too small. I find a 10 to 20 cubic centimeter syringe, with a three-inch twenty-two gauge needle, very useful for the average injection. If the needle is not too sharp or too finely pointed, one can very readily distinguish by feel, after a little practice, the various layers through which he passes it.

The tension on the injected tissues must never be increased too rapidly, nor muscle sheaths be treated at all roughly, since, as above noted, they are extremely sensitive. One who has a due regard for individual peculiarities, who watches the patient, senses his feelings, and pauses as soon as pain is evinced, will succeed in completing an injection which might be impossible in the hands of a rough and unsympathetic operator. It is good practice to infiltrate the deeper tissue layers in a field first, because in this way one acquires a certain amount of anæsthesia in the overlying planes, even before he injects them; then, too, the identification of deeper structures is vastly less difficult before a marked artificial œdema of the superficial layers has been created.

CIRCULAR BLOCK VS. DIRECT INFILTRATION

It is impossible to make direct comparison between the value of infiltrating an incision line and that of circumscribing it with a barrier of fluid, intended to desensitize the entire area through which the incision is made without getting any fluid into the operative field. There are certain different indications for both procedures, in my mind, although some operators of experience seem unqualifiedly in favor of one or the other extreme for every case. If there are no contra-indications I am inclined to use direct infiltration of the incision line in every hyperæsthetic individual, or when time must be saved for any other reason. This procedure is much the shorter of the two; there is no wait after the injection, also the anæsthesia is more reliable in many cases. There are also a number of local as well as the foregoing general grounds for direct infiltration. If a wound is to be left open, if a fistula is to be created, a drain left behind, or a pack employed, it is difficult to see why a direct infiltration is not as good as any other. If a wound, for any cause is likely to become infected, the simpler procedure is distinctly the better one to use.

Frequently a wide area of the abdominal wall is hypersensitive, as for instance, the region over an inflamed gall-bladder. If for any reason a local anæsthetic is to be used here, it seems logical to make the line of injection as short as possible, hence a direct use of procaine in the incision area is chosen.

On the other hand, I inject a circular barrier in the treatment of malignant diseases. As a matter of course, one should not risk metastases by inserting a needle point into the immediate vicinity of any such lesion. The same method is employed in the treatment of any acutely inflamed area, as for instance, a carbuncle. Direct infiltration of such tissues is just as painful as the incision itself, and at the same time may further increase tension in an acutely inflamed area, something which is very likely to result in opening up new fields to infection.

It is a very easy matter to create a circular barrier around any part of the mid-line of the anterior abdominal wall. This, however, becomes increasingly difficult as we get away from it, hence the indication here seems reasonably clear, *viz.*, to make more and more use of direct infiltration the farther we are from the mid-line. If there is any local reason for not infiltrating directly the lateral abdominal wall I should recommend a paravertebral nerve block rather than a circular barrier.

NERVE BLOCKING

The epoch marking work of Victor Pauchet should be known to every surgeon who has an interest in regional anæsthesia by nerve blocking. It is not possible to generalize very extensively regarding this division of the subject, since an individual technique for each such operation has, as a matter of course, to be based on more than a passing knowledge of peripheral nerve anatomy. It may be stated in general that the nerve or nerves supplying the region in which an operation is to be performed are injected with 1 or 2 per cent novocaine-adrenalin solution (we find 1 per cent efficacious, although 2 per cent is used by most operators). The desired nerve is identified by the paræsthesia created when a needle point strikes it, or using an insulated needle by the electrical stimulation of a mixed nerve, causing a contraction in the muscles supplied by it. A few cubic centimeters of the above mentioned solution creates a complete anæsthesia in 15

to 30 minutes, which lasts for something like 2 hours.

The different regions of the body are amenable, in the writer's opinion, in different degree to this form of treatment. By way of mentioning a few with which I happen to be somewhat familiar, will say first that the neck, generally speaking, presents a most fertile field for this sort of work. Blocking of the third or fourth cervical nerves at the points where they issue from between the vertebræ, is accomplished with remarkable ease and gives so perfect an anæsthesia over the front and sides of the neck that any operation at all may be accomplished with the utmost satisfaction to the operator and the patient.

Nothing in the whole field of anæsthesia is more satisfactory, for instance, than a thyroidectomy done in this manner. Of course, there is one theoretical risk in making such an injection on both sides of the neck at once, although I have never seen any evidences of it in practice, viz., it is conceivable that one may block and put out of commission both phrenic nerves at one time, thus causing sudden death, a possibility which must be kept in mind.

The major surgery of the chest wall and thoracic contents under regional anæsthesia has not been so satisfactory in my hands as I should like. Minor operations, such as drainage of the pleural cavity, can be very easily done, but even here I believe that an infiltration of the field is simpler, quicker, and in every way more satisfactory. When it is a matter of opening the pleural cavity widely, there are physiological considerations which demand a general anæsthesia. A consideration of them here would lead us too far afield. However, they are fully explained by Sauerbruch in his textbook on thoracic surgery.

I have done a radical breast operation under a combined regional and infiltration procedure, but do not recommend it at all where a patient can take a general anæsthesia. One must block the brachial plexus, practically all of the dorsal nerves, and then create an enormous barrier around the entire field, a procedure which is so difficult and time-consuming as to practically double the surgeon's work, and the patient's load.

In abdominal surgery the question of regional anæsthesia assumes a complexion all its own, which is not encountered elsewhere in the body. My experience leads me to feel that this is the field of all others for the combination of local, regional, and partial general anæsthesia, since we have here to do with cerebrospinal nerves, as well as with sympathetic and vagus as far as the conduction of various pain sensations is concerned.

Nothing is simpler than to get through the abdominal wall with one of the forms of infiltration or nerve blocking. But the parietal peritoneum outside the affected area is extremely sensitive, while traction upon any viscus in the abdomen causes such suffering as to make a patient uncontrollable. (The sympathetic nerves in the various mesenteries always accompany the blood vessels. As is perfectly well known, cutting, crushing, burning, etc., of the abdominal and pelvic viscera cause no pain.)

Packs cannot, in view of what has been said, be withdrawn nor extensive exploration made after a local anæsthesia which may have been sufficient for the opening of the abdominal wall alone. In view of the fact that Victor Pauchet finds it necessary to inject twenty-two dorsal and lumbar nerves in order surely to anæsthetize abdominal wall and contents, for work on both sides of the mid-line, I believe it would be pretty generally admitted that there is no rivalry between local and general anæsthesia for bilateral abdominal operations.

On the other hand, these two forms of anæsthesia surely supplement each other here, as they do nowhere else. It seems, therefore, reasonable and logical, if there be any ground to minimize the quantity of ether, to open the abdomen under local anæsthesia, then later use as much gas or ether as the patient's reaction to pain demands. A general anæsthesia is very quickly induced under such circumstances; there is practically no excitement stage while going under or coming out, and only a superficial degree of ether anæsthesia is required.

A most satisfactory combination is the following, which I may say is the standard

in our clinic when there is any contra-indication to the ordinary quantity of the ether; we give a quarter grain of morphine 30 minutes before the operation, then after the patient is entirely prepared on the table and everything is ready, we begin an ether anæsthesia and the infiltration at the same moment.

By the time the wall is infiltrated and the opening made, the patient has sufficient ether for us to explore, pack off and draw up into the incision the desired viscus, at which point ether is discontinued. This we regard as one of the peaks of the procedure.

The patient frequently wakes up, but rarely moves during the progress of the manipulation, provided, of course, no pushing or pulling be entailed. He bears now what is termed a normal load under the slight general influence of morphine, novocaine and residual ether, until the second peak is reached, by which is meant, in this instance, the removal of packs, when it is absolutely necessary to give a second small dose of ether. If the anæsthetist is given half a minute's warning, the whole procedure goes smoothly and there is no break in the technique or interruption at any time.

After the packs are out, ether is permanently withdrawn and the abdomen is closed with the patient's co-operation in many instances, and certainly without his opposition at any time, since there is never any of the forced respiration which makes it so difficult at times to approximate the deeper abdominal layers of a patient who is stimulated by ether, or cyanotic from its use, and subconsciously fighting for air. The novocaine infiltration suffices to make the closure absolutely painless.

I have been impressed more than once by the fact that a second operation, a perineorrhaphy for instance, may be done with almost no ether and with no local anæsthesia at all, after one of these abdominal operations under the combined method as described above. Abdominal work in general is better done under combined anæsthesia than under the regional form which involves the blocking of twenty-two spinal nerves; however, certain local fields may be invaded, as for instance, kidney, and biliary passages by the injection of only eight nerves, which is a number well within reason. When one considers that these organs often present a parenchymatous involvement which makes ether dangerous, it seems quite reasonable to operate on patients so afflicted under nerve block.

For the sake of completeness, one may in passing mention visceral anæsthesia secured by injection of the great ganglia and plexus high in the posterior abdomen, though lacking experience with it. It is highly probable that a glance at the anatomy of this region has been sufficient to deter many another investigator, as it has the writer, from attempting pioneer work in this field.

A form of regional anæsthesia which gives us the greatest satisfaction is that secured by the transsacral route. Here we go directly through the ten sacral foramina from behind and block the anterior brachia of the sacral plexus. This enables us to do anything on the viscera in which the gynecologist, urologist, and proctocologist are interested, keeping in mind that the anterior abdominal wall is not affected.

The extremities as one might readily suspect from their anatomical characteristics, furnish the most fertile field of all for the use of nerve blocking. This has been a matter of such common knowledge ever since the epoch-marking experiments of our own Dr. Matas, that a further discussion of it would be superfluous. We doubtless have Dr. Matas to thank for the inspiration which culminated in the invaluable contribution to this department of surgery by his pupil, Dr. Allen.

SUGGESTIONS EVOLVED FROM AUTHOR'S EXPERIENCE

It occurred to us long ago that a large amount of fluid used in infiltration increases the patient's intake in a very definite manner and without causing discomfort. This reasoning was carried to the extent of gradually increasing the amount of fluid while decreasing the percentage of novocaine from one-half to one-sixteenth, by virtue of which we now administer any desired quantity of fluid

by hypodermoclysis without inducing any real suffering; in fact, the procedure attracts very little attention in many instances.

It is stated in Braun's epoch-marking work on local anæsthesia that the gall-bladder is a forbidden field. It may be worth while to mention in this connection that the writer has repeatedly drained the gall-bladder and removed deeply seated stones without discomfort to the patient, after aspirating the bile and then replacing it with 5 per cent cocaine for a very brief period. This, of course, after a simple infiltration of the abdominal wall.

I have injected the anterior sacral nerves with the abdomen open, under ether, for the performance of second operations on the rectum, anus, and external genitalia. I do not believe it is even necessary to strike the nerves with accuracy, as one gets a fair regional anæsthesia by merely making a massive injection under the soft tissues covering the hollow of the sacrum, thus causing fluid to suffuse everything in the neighborhood of them. One saves a large amount of ether while the abdomen is being closed under infiltration and during the period of preparing a second field for operation on the organs mentioned.

I might by way of repetition stress the plan used so frequently in our clinic of beginning infiltration and ether at the same time, then doing a laparotomy and employing no more ether during the rest of the procedure except when the patient shows unmistakable signs of needing it under peak load.

CONCLUSIONS

1. It is to be definitely understood that ether by the drop method is the anæsthetic of choice in our clinic for major surgery in general, and local anæsthesia in some form for minor surgery. But we go much further than this, hence an attempt has been made in this address to deal with the large number of special considerations, which do not fall into either one of the above mentioned classes.

2. One must always keep in mind that local anæsthesia has definite limits which are not to be transgressed; I have attempted to make many of them clear.

3. I believe that with increasing experience and better training we shall some day have to establish indications for general anæsthesia rather than for local, as is the common experience today. It will then seem no more reasonable to anæsthetize the entire organism for a strictly local operation on it, than it would at the present time to bind or splint the entire body for an injury to an extremity.

4. Surely no one will advocate the use of local anæsthesia to the point of interfering with the smooth and rapid conduct of a surgical procedure.

5. It may be safely stated that the anæsthetization should never be larger than the operation; for example, one should not under ordinary circumstances attempt a radical breast operation, or it seems to me, any one of the larger abdominal procedures which involve both sides of the mid-line, under local anæsthesia alone.

6. The operator will have to train himself especially for this work if he expects to be successful in it, although in a busy clinic it is unquestionably the correct plan to have one associate who has this phase of surgery wholly in his hands.

7. There is, to my thinking, a very definite field for the local anæsthetist. I am sure that such an individual should play a rôle similar to that which is well known in general anæsthesia. His services ought to be in demand by the surgeon who makes only an occasional use of these methods, or by one who is not temperamentally suited to the acquirement of them.

I have been so fortunate as to profit by the accomplishments of my assistants, Dr. Sam F. Wennerman and Dr. William Murray Winn, to whom I am indebted for most of my local anæsthesias in recent years, to say nothing of much of the enthusiasm which I have acquired for this subject.

ACUTE PARTIAL ENTEROCELE [1]

By CHARLES F. SAWYER, M.D., F.A.C.S., Chicago

A PARTIAL enterocele is an abdominal hernia in which only a part of the circumference of an intestine projects as a diverticulum through a hernial opening. This will reduce but does not usually completely obliterate the intestinal lumen. Hildanus, in 1598, was the first to mention this finding, but his case was not definite enough to prove that such a condition could occur.

There has been some confusion in nomenclature. By the older writers and by some of the more modern, the disease has been termed "Littre hernia." Littre's description in 1700 was, however, that of a hernia of Meckel's diverticulum and his cases were examples of that condition rather than partial enterocele.

In 1731, LeDrau described the first genuine example of this hernia and in 1757, Louis, in an article on "Gangrenous Hernia," says, "the gut is not always engaged in the ring by a portion large enough to form a loop. Often it is only nipped and that over a surface of varying extent." He thought a spontaneous cure of a fæcal fistula would be proof of the hernia having belonged to this type. His cases were not conclusive.

In 1778, Richter gave us the first really scientific and complete description of the condition and because of this, by many it is now called "Richter's hernia."

Treves, in 1887, was the first to make a comprehensive study of the literature. He collected 50 cases, 4 of which were his own. He remarked that the condition was rare but not a curiosity.

I believe we may now state that it is uncommon rather than rare and of sufficient importance to merit our close study and attention. The available statistics show that it occurs more often in women than men and in adults than in children. It is most frequently femoral and occurs more often in old herniæ that have been reducible. Among the theories advanced as to its mode of formation may be mentioned the following: A loop of intestine may have become adherent over a hernial ring and through increased intra-abdominal and intra-intestinal pressure, a small portion of the bowel has been forced through. Stahl presents an interesting theory based on some case reports of Robinson. He thinks the condition may be due to irregular action of the muscles in the gut wall, or what he terms "disordered peristalsis." He illustrates this by his operative experience with aluminum and glass drainage tubes with holes in their sides. At one time when such an aluminum tube was used, a bud of intestine became strangulated in one of the holes of the tube wall, necessitating a second operation. In another case in which a glass tube was used, a similar intestinal strangulation was relieved only by breaking the tube.

Any part of the bowel may be imprisoned, but the ileum is the portion usually caught. There is usually no confinement of omentum or mesentery. The amount of the circumference of intestinal wall involved varies greatly, but in general it is that farthest from the mesenteric attachment and the line of constriction is circular in outline. The intestine may or may not be adherent within the sac. The same may be said of the continuing intestine outside of the sac. In two of my three cases there were no adhesions, either within or without the sac.

The obstruction to the lumen is naturally variable and upon this point largely depends the wide diversity of the symptoms. The constriction may obstruct the passage of fæces but still allow the passage of gas. As White remarks: "It is possible to have a constriction water tight but not air tight."

The condition of the bowel governs the symptomatology.

In one-third of the cases we find symptoms of the typical strangulated hernia, while in the remainder the symptoms are less severe and offtimes misleading. The pain may be sudden and sharp, located in the region of the hernia, but it is often diffuse over the abdomen without localization. In two of my

[1] Read before the Chicago Surgical Society, December 3, 1920. (For discussion see p. 84)

cases there was no history of localized pain at hernial site at any time but the colicky-like pain was referred to the epigastrium as in an appendix. The vomiting is less frequent and severe than in most strangulations but it usually occurs. It has very little relation to the constipation and later becomes fæcal in only a small percentage of cases. As regards bowel action, we may have any degree from a diarrhœa to complete stasis. In a large percentage of cases there are bowel movements after the strangulation has occurred. Meteorism is rare because the escape of the gases through the only partially obliterated lumen of the bowel prevents abdominal distention. The hernial protrusion is usually small and may be entirely unnoticed. In Treves series it was neither recognized nor suspected during life in 50 per cent of the cases. In many of the femoral type, there is an enlarged lymphatic gland in front of the femoral opening which may lead to a diagnosis of adenitis. The leucocyte count is of little or no value. The temperature, pulse rate, etc., are as in other strangulations.

The diagnosis is very important but often difficult because of the lack of uniformity in the symptoms. Only by the closest attention to history and the clinical course can we come to a correct conclusion as to the pathological findings.

As to prognosis, it is disappointing in a partial review of the literature to note that we have a mortality of over 50 per cent even in the cases operated upon. This is undoubtedly due to the late diagnosis and to the fact that in many of these cases gangrene occurs earlier than in other strangulated hernia because the constriction is applied directly on the gut without any protection being afforded by the constricted mesentery.

Treatment is operative and immediate; temporizing methods will fail. In most cases efforts at reduction are unjustifiable. The operative risks are far less than those of taxis.

As the bowel may be found in any condition from a mild congestion to a gangrene with perforation, the type of operation will, of course, depend upon the conditions found. In this connection, I wish to commend in certain cases the invagination operation mentioned by Jones, in 1904. Inasmuch as the bud of strangulated intestine is often small, it may be turned back into lumen of bowel by means of suture without vitally interfering with the future patency of the gut. With the patient in collapse, this certainly has an advantage over resection. This is illustrated in one of my cases.

What we may learn from case reports may be of diagnostic value and in turn help lower the alarming mortality of this condition. With this as justification, I wish to report the following three personal cases:

CASE 1. Mr. B, a restaurant proprietor, age 32, entered my service at Mercy Hospital at 3 p.m. March 24, 1918, with following history: Five years before he had been operated upon for acute suppurative appendicitis. The wound healed after prolonged drainage, leaving a protrusion at the site of the scar. This bulging varied in size when straining, etc., and was never very tender or painful. Eighteen hours before present admission, he was seized with sudden severe pain referred to epigastrium. Pain was excruciating and there was general abdominal tenderness with localization in a protruding mass in the old scar. The bowels did not move but some gas was expelled. He presented the typical picture of strangulation of a very severe character and was sent at once to the operating room. An incision was made along the outer border of the very tense hernial protrusion. A good sized sac was opened containing dark bloody fluid and a mass of omentum adherent in places to the sac wall. At the neck of the sac, at the side of the small base of this omental mass, there protruded a very dark, plum-colored bud of intestine. When released this was found to be ileum and the constriction had involved about one-half its circumference. There were no adhesions of this particular loop either within or without the sac. Moist heat seemed to produce but little change in the blackened bowel, but because the blood vessel supply in mesentery and proximal half seemed unaffected, the bowel was not resected, but was placed in the abdomen beneath the incision, with a cigarette drain beside it. Adherent omentum was ligated at base and excised together with most of the sac wall and the abdomen closed. He made a very good recovery and has had no trouble since.

I have been unable to find in the literature any case similar to this, viz., an acute partial enterocele in a postoperative hernia.

CASE 2. Mr. H., age 80, referred by Dr. Mandel, entered my service at Mercy Hospital, January 9, 1920. He had been suffering acutely for 2 days from abdominal pain and persistent vomiting. His temperature was 97 and general condition poor.

The abdomen was not greatly distended nor tender and no abnormal masses could be felt. He gave a history of having had a right-sided hernia for many years and over the right femoral opening was a protruding mass which seemed like an infected lymph gland. It was not tender and there was no pulsation on coughing. Immediate operation was advised but refused by patient who insisted that his difficulty was stomach trouble, as his pain had all been in mid-abdomen with none at all in region of hernia, and he knew hernia had nothing to do with it.

During the 36 hours following admission, his bowels moved freely, three times, but his condition otherwise became worse and he finally consented to operation. A large infected lymph gland was found in front of a right-sided femoral hernial sac. The sac was distended and contained pus, blood, and fæces. At the femoral opening there was a small intestinal protrusion caught tightly in the ring. At the tip of this protrusion there was a perforation from which escaped fæces. The entire protrusion was grayish black and gangrenous. After enlarging the ring and freeing the loop which was found to be ileum and entirely free of adhesions, it was found the gangrenous portion included about one-fourth the circumference of the bowel. As the adjacent bowel was in good condition, the gangrenous bud was disposed of by inverting it into the lumen by suture. The loop of intestine was placed in the abdomen immediately beneath ring and a small drain inserted. The infected gland and sac were removed and the wound closed. This patient had normal bowel movement the second day after operation and aside from slight infection of wound, made an uneventful recovery, leaving the hospital 27 days after operation. He had no trouble with bowels after recovery.

This patient was remarkable for his energy and initiative, considering his age; e.g., during the night following operation when proctoclysis had been inaugurated and the nurse was not watching, he removed tube from rectum, got out of bed, went to faucet where he drank all the cold water he wished, then got back into bed and reinserted rectal tube as before.

CASE 3. Mr. S., age 53, clerk by occupation, entered my service at Mercy Hospital at 11 a.m. October 16, 1920. Three days before admission he began to have severe abdominal pain followed a few hours later by persistent vomiting which on day of admission had become fæcal. Both cathartics and enemas had failed to move bowels. His abdomen was greatly distended and there was general tenderness without localization. He was a typical picture of ileus in a far advanced stage, with subnormal temperature, barely perceptible pulse, cold moist skin, etc. He had had a left inguinal hernia for several years, but examination here failed to reveal either tenderness or tumor.

Operation shortly after admission by median laparotomy below navel. Conditions found were those of acute bowel obstruction with the cause found in the old hernial ring where three-fourths the circumference of a knuckle of small intestine was tightly constricted but not completely strangulated. There were old adhesions holding the loop intestine outside of the sac. The bowel after relieving constriction and adhesions was only a little discolored. A small drain was inserted and the abdomen closed without other attention to hernia. He rallied for few hours but died 12 hours after operation. In this case, although only three-fourths the circumference of bowel was constricted, the obstruction to lumen had been complete.

SUMMARY

The condition of acute partial enterocele is not so rare as formerly considered and may occur at any abdominal hernial site.

Symptoms are milder than in other strangulations and lack uniformity. The fact that pain is referred to the epigastrium with little or no localization at the hernial site is noteworthy.

The diagnosis must be based on history of old hernia usually, symptoms of strangulation without the constipation in many cases, the lack of abdominal distention, and the small tumor mass or none at all at hernial site.

The prognosis is unfavorable because of late diagnosis and early gangrene of gut.

The treatment is operative at earliest possible moment.

A COMPARATIVE STUDY OF THE END-RESULTS OF CHOLECYSTOSTOMY AND CHOLECYSTECTOMY[1]

By FRANK D. MOORE, M.D., F.A.C.S., Chicago

WHILE considerable has been written in the past few years concerning the relative values of cholecystostomy and cholecystectomy, it would seem, from the variance of statistics and the many discussions brought forth by each succeeding paper, that the subject is still an open one and that much remains to be said, before any really satisfactory conclusion can be reached.

There has been much discussion as to the *immediate* value of the operations themselves, as to their ease of performance, difficulty of technique, and degree of safety to the patient. As to this point, there is probably but one answer: while cholecystectomy may become, in the hands of the experienced surgeon, a relatively speedy and safe operation, yet it is undeniably true that in the hands of the occasional operator, or in the event of complications or general debility on the part of the patient, cholecystostomy must invariably be the safer operation, the one requiring the minimum both of time and risk to the patient, and at the same time affording also the prospect of immediate and at least temporary relief. We are not to consider, however, that our average surgeon is inexperienced or that he cannot become skillful enough to avoid the dangers that follow upon faulty technique, so that this point we shall not take into consideration at all.

This paper is, then, an attempt to compare not the immediate relief afforded the patient, nor the ease and safety of operation, but the *end-results*, the factors which will make for the well-being and health of the patient years after operation. He may, it is true, be much benefited for a time or may even have complete relief following either of these operations, but in which case is he more likely to obtain permanent relief from his trouble and in which is he going to return to us in a few months or years with the same complaint for which the first operation was performed? It is, then, the condition of the patient, as many years as possible after operation, which we wish to study and from which we can draw our most satisfactory conclusions.

Formerly, and, in fact, until about the past four or five years, cholecystostomy was considered by most surgeons to be the operation of choice in practically all cases of chronic cholecystitis, stones in the gall-bladder, acute inflammatory conditions and anything short of malignancy. It was done, in most cases, partly because the immediate relief afforded seemed to be a fully adequate reason for its performance and partly because many operators did not, according to their own reports, realize the comparative speed and safety with which, with experience and improved technique, a total removal of the gall-bladder could be performed. Many writers whose articles have been published during the last two or three years, have discussed their results, with the modifying statement, that formerly they performed drainage operations upon nearly all of their gall-bladder cases in preference to the now more popular excision. There have, however, been some exceptions to these views, a few surgeons stating that there seemed to be as many recurrences following their cases of removal as of drainage.

In studying the actual statistics not only the author's own series of cases were reviewed, but a number of series given in detail in the literature of the past three years. The total number of cases cited were about three thousand, with a second report on about two hundred and fifty made several years after operation. These figures, of course, comprise those given by a number of operators, and the result and deductions, therefore, must, of course, be only approximate, but a fair perspective can thereby be obtained and a number of working principles be evolved.

These series were studied with an effort to discover several things:

[1] Read before the Chicago Surgical Society, January 7, 1921 (For discussion, see p. 87)

1. The relative number of recurrences of symptoms in the case of cholecystostomy and cholecystectomy.

2. The type of symptom most liable to follow operation.

3. The etiological conditions which most frequently permit the recurrence of symptoms, together with the type of operation preceding the pathology.

4. The relative period of freedom from symptoms following each of the two types of operation under discussion.

5. The relative mortality.

6. The immediate pathological result, if any.

As to the relative frequency of recurrence of symptoms in the two types of operation here discussed, that is, total removal and drainage of the gall-bladder, results in the total number of cases studied were tabulated as follows: secondary operations following cholecystectomy 57; cholecystostomy 89. Average period of relief following cholecystectomy 2½ years; cholecystostomy 8 to 9 months. Average condition of patient 3 to 10 years after operation, classified as good, fair or bad, cholecystectomy 70 per cent good, 20 per cent fair, 10 per cent bad; cholecystostomy 40 per cent good, 45 per cent fair, 5 per cent bad. Average mortality: cholecystectomy and cholecystostomy, approximately 5 per cent.

Pathological conditions found most frequently during secondary operations following cholecystectomy were dilatation of ducts; adhesions; stones; stricture of common or cystic duct, due to trauma; pancreatitis: following cholecystostomy, stones in bladder or ducts; chronic cholecystitis; adhesions; fistula; stricture of ducts or of ampulla of Vater; cholecystitis; obstruction of the pylorus.

These show that the majority of recurrences following cholecystectomy are mechanical and due largely to errors in technique, undue trauma, etc. They can, therefore, be largely avoided. The recurrences following drainage are, on the other hand, largely due to primary pathology and as such, can only be prevented by a removal of the original cause. Deaver stated that 65 per cent of his recurrences could have been prevented by removal.

From these approximate results, certain deductions can be drawn, as at least, working principles:

1. There is no evidence that a total extirpation of the gall-bladder results in any serious or permanent impairment of body function or metabolism. Indeed, numbers of cases apparently enjoy the best of health for many years following cholecystectomy, while the flow of bile into the duodenum becomes constant instead of intermittent. The dilatation of the common duct probably acts as a partially compensatory measure and the system apparently adapts itself readily to the new schedule of operation. Certainly, we often find more interference with intestinal digestion during prolonged drainage in which the bile is almost entirely passed off outside the duodenum, as many cases seem unable to tolerate this absence of bile in the duodenal contents. The question is also raised as to its effect on the pancreatic function, due to the lack of biliary stimulation on that organ.

2. As to the type of symptom recurring most frequently after operation, the majority of patients reported pain of the typical gallstone type, together with flatulence, nausea, and vomiting; jaundice, considerably less frequent. These symptoms are not to be distinguished from the type of complaint with which the patient comes, primarily, under observation, so that it can safely be assumed, in cases of drainage at least, that the cause which produced the original trouble is generally the cause of recurrence; that is, that the symptoms have been temporarily relieved, while the original cause of the disturbance, the real seat of pathology, has not been touched at all. This cause is generally in such cases, the presence of chronic cholecystitis, with or without accompanying stones. In cases of removal, however, outside of adhesions, the cause of recurring symptoms must be laid to the door of stones in the common or cystic ducts, dilatation of the ducts consequent upon removal of the bladder, chronic pancreatitis or one of the other possible complications.

3. As to the type of pathological condition which most frequently permits the recurrence of these various symptoms, only one recent series of cases found in the literature gave de-

tailed figures. Deaver and Reimainn in a series of 70 cases of secondary operation, give a record of the pathological conditions found at the second operation, as follows: Adhesions were the most frequent pathological condition found, occurring in 39 cases, or 52 per cent. Stone in the gall-bladder or ducts was found in 26 cases. Other pathological conditions were: cholecystitis, fistula, obstruction of the common duct, chronic pancreatitis, pancreatitic lymphangitis, pyloric obstruction and stricture of a duct or of the ampulla of Vater. These were about the same conditions noted in other reports as well as in the author's own series.

In the case of adhesions, the worst ones, it is true, were those found following cholecystectomies, but this must also be considered in view of the fact that a total removal of the gall-bladder requires, of necessity, considerable more trauma to surrounding tissues than a mere opening and drainage of the bladder, without an attempt at removal; also that many cholecystectomies were secondary to a previous cholecystostomy.

Stones were the next most frequent cause of recurrence of symptoms and these were by far more common in cases of primary drainage. In many cases they may have been mere sandy material, overlooked at the first operation and later developed to a size which produced symptoms. As to how many of the stones found in secondary operations have been formed entirely within the intervening period, it is impossible to say, and in this connection it is probably wise to emphasize the importance of making, during cholecystectomy, a thorough examination of the common duct as to the possible presence of stones.

Chronic cholecystitis was the third most frequent cause of recurrence and occurs, of course, only after drainage cases, most of which had primary operations, for the relief of symptoms only, that relief disappearing as soon as the temporary drainage established by operation had disappeared. In this class of cases, where symptoms have gone on usually for years before the patient comes under observation, and where often at operation the gall-bladder is found to be atrophic and practically functionless, there is surely the strongest indication for a total removal of the long-offending seat of infection.

Out of a series of 51 cases of secondary operation, 36 were found to have followed primary cholecystostomy and 15 cholecystectomy. In other series, results varied widely, but in the total tabulation, many more secondary operations followed drainage than excision. In some of these cases, also, more than one drainage had been performed before removal was attempted.

The relative period of freedom from symptoms varied in drainage cases, from a few months to nine or ten years, with an average approximate interval of two or three years. In cases of removal the period of freedom from symptoms was much shorter, usually recurrences coming on if at all within the first one to two years, but this is offset by the fact that more cases of removal remained entirely free from symptoms for an indefinite period or as long after operation as it was possible to trace the patient.

The relative mortality of the two operations was found to be approximately the same, that is, about 5 per cent. This is probably made so by the fact that while cholecystectomy, in itself, is of greater immediate risk to the patient, cholecystostomy is performed in a number of cases in which the previous condition is such as to make him a very poor operative risk, although necessitating operative interference.

Immediate pathological results of removal of the gall-bladder are, first of all, the dilatation of the ducts, which occurs probably in compensation for the loss of the gall-bladder. This is a condition also found following atrophy and loss of function of the gall-bladder and is usually associated with any long-continued chronic cholecystitis. It may then be regarded, when found following removal of the bladder, not so much in the light of a pathological condition, as a normal compensatory affair, much as we regard the establishment of a collateral circulation when the original channel of circulation has been blocked off.

Another pathological condition, coming on fairly soon after operation, is one which may follow either cholecystostomy or cholecys-

tectomy—the formation of adhesions, with the possible binding down of the omentum or duodenum or adhesions of the hepatic flexure to the liver. These adhesions, however, cannot be regarded as a mere development due to operation alone, as the degree of skill employed in the technique of operation makes a great difference in this particular sequel.

Functional derangements sometimes occur, following drainage cases, due to the fact that the intestines do not tolerate well the absence of bile from their contents. This occurs also in any case of postoperative stricture or obstruction of the common duct.

Pancreatitis may follow traumatism in operation but is a rare sequel.

Hernias are more frequent after cholecystostomies than after cholecystectomies, due to the much larger opening left in the abdominal wall, the slowness of the healing process and the infection of the incision which frequently follows prolonged drainage. It has been found to occur twice as often and to a much greater degree in the latter type of operation.

SUMMARY

We may, then, summarize the end-results of cholecystectomy as compared with those of cholecystostomy, as follows:

In general, cholecystectomy is the operation of choice in all cases, except where general debility, serious complications such as abcess, peritonitis or previous extensive adhesions make removal too dangerous or prolonged an operation. In these cases, cholecystostomy with possible later cholecystectomy, may be done with advantage.

It has been proved by numbers of cases and observations by various authors, that a removal of the gall-bladder is not, in itself, detrimental to the future health and well-being of the patient. Why, then, permit the patient to face the risk, not only of possible, but of probable recurrence of trouble, with the necessity of a future second and more difficult operation, when in the hands of a careful surgeon, a total removal of the offending organ may be done with but slightly greater expenditure of time and with but little more immediate risk to the patient?

Judgment in the selection of cases for removal, early diagnosis and early operation, all make for the choice and ultimately vastly more satisfactory results of cholecystectomy.

The value of this method of treatment for appendicitis is unquestioned, and it seems as logical to follow this same procedure in the case of a similarly affected gall-bladder. A diseased appendix is obviously of no use and is manifestly a source of danger. Is not a functionless and diseased gall-bladder to be regarded in the same light?

The diseased gall-bladder has also come much into the limelight, of recent years, as a focus of infection for various forms of arthritis, anæmias and general constitutional disturbances, and many removals of the gall-bladder have been followed by marked improvement in the general bodily metabolism and welfare.

It would seem, then, that cholecystostomy may well be regarded only as a makeshift or temporary resort, where conditions are such as to contra-indicate the performance of a truly remedial operation, and that cholecystectomy may be accepted as the operation of general choice.

RESULTS IN OPEN TREATMENT OF FRACTURES[1]

By JOSEPH F. SMITH, M.D., F.A.C.S., Wausau, Wisconsin

IN this brief report of results obtained by the open treatment of fracture it is not our purpose to discuss the relative merits of the open and closed methods of treatment, nor the advantages and disadvantages of the various operations that have been proposed, nor of the different devices that have been developed by those who have advocated open treatment. It is our purpose to summarize briefly our methods and results in a group of 97 fractures in which we have employed open treatment in one form or another.

It has been our custom to treat by the open method only those cases in which, in our judgment, it was impossible to *secure* and *maintain* satisfactory approximation by the older methods. It is recognized that there exists a wide difference of opinion as to what should be regarded as satisfactory approximation. End-to-end apposition of one-half to two-thirds of the fractured surface, with good alignment and without rotation deformity we have regarded as satisfactory without recourse to open methods. In cases in which these conditions could not be secured and maintained we have employed open treatment unless there existed general or local conditions which contra-indicated operative measures.

METHODS EMPLOYED

We have endeavored to employ in each individual case that means of fixation which seemed easiest of application in the particular condition presented, provided it sufficed to secure and maintain a satisfactory reduction until the proper fixation dressing of plaster or splints could be applied. Plaster casts, with windows cut out for after-care of the wound, have been the means of fixation most frequently employed. Where plates or bands have been used it has generally been our custom to re-open the wound under local anæsthesia and remove the plate about two or three weeks before removal of the fixation dressing so as to allow time for the wound to heal before the patient's discharge. In open operations, particularly on the long bones, we have been impressed by the frequency with which strands of muscle, fascia, or periosteum have been found impacted between the ends of the fragments, often in such a location as to render entirely impossible anything like complete reduction by indirect methods.

AFTER-CARE

Patients who have had fractures treated by the open method should be given massage and active and passive motion after removal of the fixation dressings in exactly the same manner as patients treated by the closed method. The joints should receive early attention in order to avoid ankylosis, stiffness, and prolonged disability.

In a series of 97 cases treated by open method the bones affected were:

	Cases		Cases
Femur	26	Lower jaw	2
Fibia	14	Upper jaw	1
Humerus	11	Patella	6
Tibia and fibula	12	Carpal bones	2
Fibula	1	Metacarpal bones	2
Radius	5	Metatarsal bones	1
Ulna	1	Olecranon	2
Radius and ulna	6	Both radii and both ulnæ	1
Clavicle	4		

The means of fixation employed were:

	Cases
Lane plate	38
Intramedullary graft	2
Bone graft (sliding)	4
Bone screws or bone pegs	5
Silver wire	33
Kangaroo tendon	1
Parham-Martin band	1
Open reduction, no fixation device	9
Excision of fragment	3
Steel nails or screws	6

We have encountered the following complications:

	Cases
Infection (simple fractures)	2
Infection (compound fractures)	12
Failure of union	1
Delayed union	3
Infection, failure of union—amputation (compound fracture)	1
Bone graft lost by infection, later union	1
Refracture by fall after removal of cast	2

[1] Read before the Chicago Surgical Society, December 3, 1920. (For discussion see p. 84.)

Infection occurred in two cases of simple fracture which were subjected to open operation. In the first one of these, the fracture consisted of a comminuted fracture of the femur with several large loose fragments. The patient's condition was extremely bad on account of shock and exposure. The operation in this case consisted of simple circular wiring of the ends of two of the fragments with silver wire. Notwithstanding the very simple procedure a very severe infection ensued, which resulted in a long-standing osteomyelitis.

The second case was one with comminuted fracture of both bones of the leg in an elderly man due to an explosion of dynamite. In this case there was extensive comminution of both the tibia and fibula with considerable bruising of the surrounding tissues. The operation carried out in this case consisted of a sliding bone graft, which was done about 4 or 5 days after the injury. Evidently the injury to the surrounding tissues made conditions unfavorable for open operation; infection followed with loss of the graft and a long-standing osteomyelitis which required several months to clear up.

In both these cases healing finally occurred with union. In a few of the other cases there have been slight superficial infections which cleared up without any osteomyelitis after removal of the fixation device.

It has been our impression that the preservation of the periosteum is very important in open operation, especially on the long bones; that in no case should the periosteum be stripped or scraped from the bone in applying the fixation device. In using the Lane plate we are very careful to preserve the periosteum, applying the plate outside the periosteum and after the screws have been turned down securely, they are given a half turn backward, in order to prevent harmful pressure necrosis on the bone and periosteum.

PRIMARY SCLEROMA OF THE LARYNX IN A NEGRO BORN IN MARYLAND

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SCLEROMA of the upper respiratory tract is a very rare disease in this country. A few cases have been reported but all that are authentic have occurred in immigrants from Europe (1, 2, 3, 4). Only two cases have been encountered in some one and a half million patients treated in the wards and out-patient department of the Johns Hopkins Hospital during the past 30 years: one was in an immigrant who had been treated in Berlin before coming to America; the other, which is recorded in detail below, is, so far as we can learn, the first case observed in a native of the United States. The patient was a negro, born in Baltimore, who had not been out of this country, except to the West Indies and Central American countries, where he went as a fireman on a ship that plied between Baltimore and southern ports.

The following is an abstract from the hospital records of the case (Surg. No. 42,107).

R. C., colored male, born in the United States; age 23; laborer and sometimes marine fireman. Admitted March 12; died March 18, 1917.

There was nothing of interest in the family or personal history except an admission of an attack of gonorrhœa 6 years before, and a denial of lues.

Present illness. According to the patient, on one occasion, 3 years before, he had suffered from an attack of "short windedness" which lasted for about 12 hours. He had no pain or difficulty in swallowing but complained of a sense of tightness over the upper central part of the chest. He experienced no more trouble until 6 months later when he had two attacks in 4 days, each lasting through the forenoon. Three weeks before admission (the patient says) he was in St. Augustine, Florida, and caught a severe cold. That night he began to have difficulty in breathing which gradually became worse. He returned to Baltimore on March 5, and after a night of severe dyspnœa, walked to the hospital. He complained of having something in his throat that "needs to be raised." He had no pain or difficulty in swallowing. The patient's sister thought that he had lost about 40 pounds in the last 3 or 4 years.

On admission, he was found to be suffering from marked inspiratory dyspnœa so that he had to sit up in bed. He was expectorating large amounts of thick tenacious sputum. The temperature was 101.5° F.; pulse 110; respiration 38.

The routine physical examination which included the ears, nose, mouth and pharynx revealed nothing of importance. Over the front of the chest the breathing had a tubular quality but there were no râles. Examination of the larynx at this time was unsatisfactory. We felt that we were probably dealing with a case of gummatous infiltration of the larynx and trachea, and we accordingly gave the patient mercurial inunctions and potassium iodide by mouth. The treatment, however, seemed to make him worse and it was soon discontinued despite the fact that the Wassermann test gave a 4+ reaction. During his stay in the hospital the temperature ranged from 101.5° to 98°; it was usually below 100°. His condition was, apparently, improving until the day of his death (March 18), when the following notes were recorded:

A good view of the larynx was today obtained for the first time. There was nothing abnormal above the cords, except slight œdema of the arytenoids. The false and true cords were easily seen. Œdematous red tissue was seen below the cords which was evidently producing the obstruction.

The patient has been having increasingly difficult respirations this afternoon and evening. At 7 p.m. he was sitting up in bed because of labored breathing; and during inspiration made a hoarse, wheezing, crowing noise. Occasionally he coughed. He was given 8 minims of adrenalin hypodermatically.

At about 9 o'clock the patient was much more comfortable, the respirations had dropped to 26 per minute and were somewhat less labored. At 10:25 they suddenly became much slower (6 per minute) and he died before the house officer could get to the ward.

Autopsy (No. 5068) made at 2 p.m., March 19, 1917, by Dr. William P. Finney, Jr. (only the positive findings of the autopsy record are here quoted):

There are one or two quite large glands at the bifurcation of the trachea, but there are no enlarged mediastinal glands. On opening the trachea from below upward nothing of interest is encountered until the lower level of the isthmus of the thyroid gland is reached. At this point the mucous membrane of the trachea begins to become thickened and there is a gradually increasing stenosis, until finally at the level of the vocal cords there is an almost complete occlusion (Fig. 1). The obstruction is seen to be due to a thickening of the mucous membrane which is grayish-white in color, has a rather granular

appearance, and is overlaid with a small amount of mucopurulent material. On the surface of the mucous membrane there are a few white papillomatous bead-like masses, only 2 to 3 millimeters in diameter and emerging about the same distance above the surface. Above the vocal cords there is no change in the mucous membrane except in the region of the anterior commissure. Nowhere does there seem to be any deep ulceration of the mucous membranes, but the surface here and there gives the appearance of being superficially ulcerated. There are several puckerings in the arch of the aorta, at the base of the aortic valves, and in the abdominal aorta, especially above the bifurcation.

Microscopical notes on the larynx. Sections taken through the mucosa and cartilaginous rings of the upper trachea and larynx show that the pathological changes extend from 1 centimeter above the vocal cords to the lower border of the isthmus of the thyroid gland.

The chief histological features are the following (Figs. 2, 3, 4, 5 and 6).

1. All ciliated epithelium is replaced with squamous epithelium.

2. The submucous infiltration consists of small round cells and plasma cells. There are no polymorphonuclear leucocytes present. The blood-vessels are not congested and there is no hæmorrhage. An occasional mucous gland is seen. The lymph spaces are slightly enlarged and more prominent than usual.

3. In this infiltrated area are seen large numbers of small spherical bodies (the hyaline bodies of Unna). These stain well with practically all the aniline dyes. With eosin they stain very lightly and with Van Gieson's stain, bright yellow. With methyl violet, gentian violet, methyl blue and fuchsin, they stain deeply the color of the dye. These bodies occur sometimes singly, sometimes in pairs, sometimes in clusters of four or more. Singly or in pairs they are quite large and have a diameter about five times that of a red blood cell. When occurring in clusters some are large and some quite small. A nucleus is seen in many of these hyaline bodies.

4. There are a large number of swollen pale cells, the so-called Mikulicz cells which have been well described as "lace," "foam," or "bubble" cells. They have a nucleus similar to that of a small round cell or plasma cell. The cell outline has a diameter 10 or 15 times as great as that of an ordinary plasma cell. The cytoplasm does not stain at all but running through the cell body are fine reticular lines. These give the characteristic appearance as if a number of tiny soap bubbles were cut in cross-section.

5. Within these Mikulicz cells or in the spaces which they usually occupy just beneath the epithelium may be seen short, thick bacilli. These do not stain readily but are stained well with aqueous methyl violet if they are left in the stain 1 or 2 days, and not decolorized too much in alcohol.

The section of one of the puckered scars in the aorta shows a destruction of the elastic fibers of the media characteristic of a syphilitic mesaortitis.

From the above description and the accompanying microphotographs there can be no doubt that this patient had a scleroma of the larynx and trachea with no involvement of the nasal mucous membrane. This man was a native of Baltimore but his occupation as fireman on a ship had taken him to the West Indies and Central America. He had never been in Europe.

If the true nature of the malady had been recognized and a low tracheotomy performed soon after admission to the hospital, his life would, probably, have been prolonged for several years. The clinical diagnosis, however, was syphilis of the larynx and trachea, and until a few hours before death his condition had, apparently, been much improved by simple rest in bed. The true nature of the disease was recognized only when the microscopical sections from the mucous membrane of the larynx and trachea were studied.

The autopsy disclosed syphilitic lesions of the aorta, but this was entirely independent of the lesion in the larynx and trachea.

HISTORY OF SCLEROMA

In view of the fact that American physicians are unfamiliar with scleroma, the following brief description may be of interest.

The disease was first described in 1870 by Hebra (5), who named it *Rhinosklerom*, because the nasal passages are often primarily involved. It is endemic in Austria, Poland, Galicia, East Prussia, and Southern Italy. Sporadic cases have been reported from several other countries. Some authorities think that it was brought to Europe from Asia (6).

Etiology and incidence. The etiological agent in scleroma has not been definitely determined. In 1882 von Frisch (7), for the first time, isolated in pure culture from scleroma nodules a bacillus which he considered to be the cause of the disease and which, therefore, he named the *Rhinosklerom* bacillus. It appears as a very short rod and has a capsule; it grows on ordinary media and stains easily. This bacillus, which is always to be found in the oldest lesions and in stained

sections, is seen chiefly in the Mikulicz cells. Other workers also have isolated the same bacillus from lesions of scleroma, but no one has succeeded in reproducing the disease in animals. Von Frisch failed to do so in dogs, rabbits, and guinea-pigs, using a pure culture of the bacilli, lymph from the tissue, or a piece of the diseased tissue. Many others have tried, employing various animals, but all have failed (8).

The failure to produce the disease and the fact that the rhinoscleroma bacillus closely resembles the bacillus Friedlaender, bacillus mucosus capsulatus and bacillus ozenæ have led several authors to question its specificity. Babès (9) found the von Frisch bacillus in about 50 per cent of cases of chronic inflammation of the nasal mucous membrane, and he and Perkins (10) claim that it cannot be distinguished from the Friedlaender bacillus. Neumann (11) found organisms similar to the von Frisch, Friedlaender and ozena bacilli in the nasal cavities of 20 per cent of normal persons. On the other hand, Brunner (12) isolated the von Frisch bacillus in 30 consecutive cases of rhinoscleroma, and he claims that by serological tests it can be distinguished from the other organisms of the same group. Bailey (13) also believes that the rhinoscleroma bacillus can be distinguished from all other bacilli by means of its cultural characteristics and immunological reactions.

The mode of spread is not known, but some authors consider it contagious and recommend that these patients be isolated (14 and 15). It occurs chiefly in small villages where the living conditions are very unhygienic.

The incubation period is not known because of the insidiousness of the onset. Children as well as adults may be attacked.

Pathological anatomy. At first Hebra (16) thought that the condition represented a new-growth, because of the microscopical appearances. In 1872, Gerber (17) after a microscopical study concluded that it was due to a chronic inflammatory process, and since then this has been the prevailing opinion. Scleroma most often begins in the anterior portion of the nasal mucous membrane, but it may appear primarily anywhere in the upper respiratory passages. It may also start on the skin of the upper lip or the vestibule of the nose, but tends to spread very slowly in the mucous membrane. The lacrimal ducts, the Eustachian tubes, the nasopharynx, the oropharynx, the soft and hard palates, the larynx, trachea, and bronchi may become involved. In the larynx it usually begins just below the vocal cords.

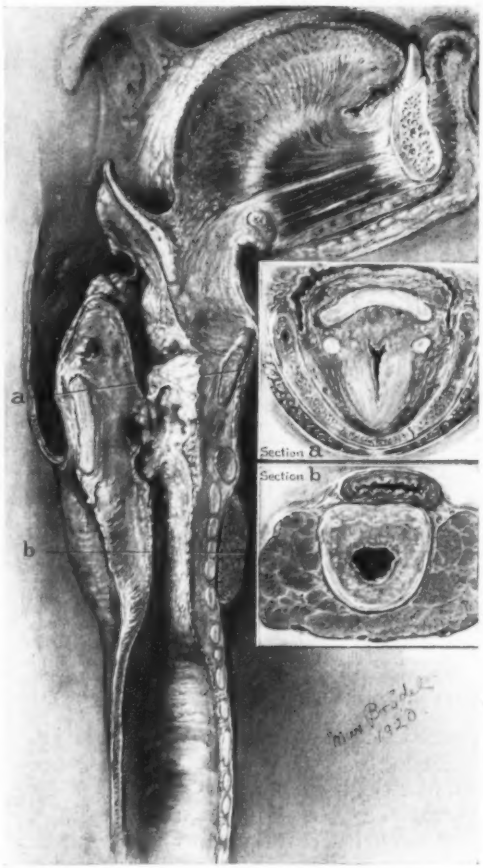

Fig. 1. Autopsy 5068—Scleroma of the larynx. The longitudinal section shows the extent of the process. The cross-sections show the size of the lumen. *a*, At the level of the vocal cords; *b*, at the level of the isthmus of the thyroid.

The lesions are usually bilateral. In the beginning they appear as small, soft, œdematous, bluish-red nodules which have well defined edges. Later these nodules deeply infiltrate the mucous membrane, become

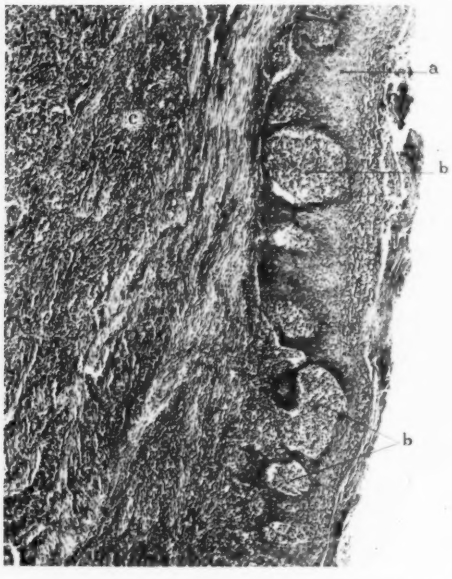

Fig. 2. A section of the mucous membrane of the trachea at the level of the thyroid gland. *a*, The ciliated epithelium has been replaced with squamous cells; *b*, areas composed almost entirely of Mikulicz cells; *c*, the round-cell infiltration and strands of scar tissue which have entirely destroyed all normal elements of the mucous membrane.

grayish in color and very hard, even showing calcified areas. They do not ulcerate, except as a result of trauma and when the skin is involved. The disease does not destroy underlying bone and cartilage. The neighboring lymph glands are practically never involved.

According to the microscopical appearances, the scleroma lesion begins around the blood and lymph vessels in the adventitial layer of the mucous membrane, and is thought to spread by way of these vessels. At first the vessels become dilated and then small round and plasma cells accumulate in large numbers around them. This causes the œdema and the early appearance of the nodules. There is also a great increase in the elastic and connective tissue. Later, the walls of the blood and lymph vessels become obliterated by the connective tissue and the cellular elements die. The softness is now lost, except where the lesion is spreading, and the mucous membrane of the original focus becomes replaced by connective tissue. The epithelium may or may not be affected, but when it is implicated, the ciliated cells are converted into thick layers of stratified squamous cells, and eventually the normal structure of the mucous membrane is destroyed. In the skin, the sweat and sebaceous glands are destroyed and the hairs are lost.

The most characteristic microscopical finding in scleroma is the large cell with vacuolated and poorly staining protoplasm which is known as the "Mikulicz," "foam," or "lace" cell. It was first described by Mikulicz (18) in 1877, whose publication on scleroma is among the best. These cells vary in size but, when typical, have a diameter from 15 to 20 times as large as that of a red blood corpuscle, and usually contain one or more nuclei. The foamy, reticulated appearance of the protoplasm has been attributed to the mucus elaborated by the rhinoscleroma bacillus, which is present in large numbers within them. They are most numerous in the oldest lesions and are most often seen just under the epithelium. Mikulicz cells are thought to be

Fig. 3. A section of the mucous membrane of the larynx below the vocal cords. *a*, A thick layer of squamous cells has replaced the ciliated epithelium; *b*, epithelial pearls closely resembling those seen in a squamous-cell carcinoma; *c*, the cellular infiltration. The predominating types of cells are: mononuclears, Mikulicz cells, and spindle cells.

a degeneration or hydropsic form of large mononuclear leucocytes.

Another characteristic of scleroma is found in the homogeneous, round masses of hyaline-like material, which are scattered throughout the tissue. These bodies, first described by Unna (19), have a diameter from 3 to 5 times that of a red blood corpuscle and stain intensively with all of the acid dyes. Some authors think that they have a nucleus; others, that they have not. Their origin has been ascribed to degenerated red blood corpuscles. Another explanation is that they represent the end-stage of the Mikulicz cells and that their protoplasm and the bacilli within them are changed into hyaline.

Symptomatology. The clinical course of scleroma is very slow; some cases last from 20 to 30 years. The first symptoms are apt to be nasal obstruction, repeated epistaxis or deformity of the external nose and upper lip. The skin, when involved, becomes dry, cracked, and ulcerated. Later, as the disease spreads to other parts of the upper respiratory tract, other regional symptoms appear. In the larynx the disease, as a rule, begins below the vocal cords and extends upward or downward. The symptoms are hoarseness, a metallic cough and dyspnœa. The last may become so marked as to require a tracheotomy.

Fig. 4. A section from the larynx below the cords that shows: *a*, Dense scar tissue of this type replaces all cellular elements in the end-stage of the disease; *b*, the intrinsic muscles of the larynx surrounded with scar tissue and round cells (c).

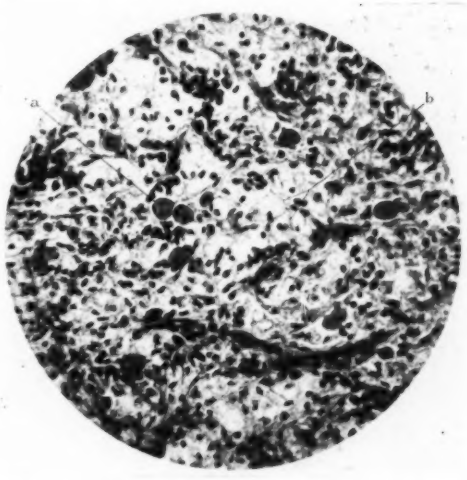

Fig. 5. *a*, The hyaline bodies of Unna; *b*, the "foam cells" of Mikulicz.

The presence of these two types of cells together with the demonstration of organisms in the Mikulicz cells (Fig. 6) establishes the microscopical diagnosis of rhinoscleroma.

The lesions are very hard but not painful, except slightly to the touch. Sometimes when the disease is well advanced there is contraction and deformity.

Scleroma does not prove fatal, except when the larynx, trachea, or bronchi are so much involved that suffocation ensues.

Diagnosis. Scleroma may at times be confused with tertiary syphilis, leprosy, lupus, sarcoma or carcinoma, any of which it may closely resemble. Clinically, the points in favor of scleroma are: marked chronicity, absence of tissue destruction and of pain, an ivory hardness of the lesions, and the European nationality of patient. A certain diagnosis, however, cannot be made without a microscopical study of a piece of the diseased tissue.

Treatment. All forms of treatment are almost valueless in the end-stage of this dis-

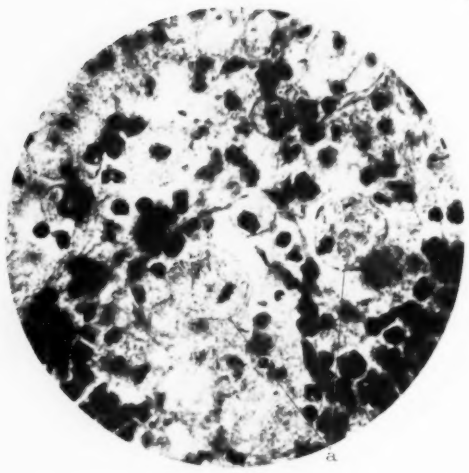

Fig. 6. An oil-immersion view of one of the nests of Mikulicz cells shown in Figure 2. Note the large number of bacteria in these cells.

ease. When the trachea is involved, however, the dyspnœa may be temporarily relieved by repeated curettage and dilatations. In the early stage the X-ray and radium have been used with more success than any other agents. Some cases have greatly improved and a few "cures" (20) have been reported. Brunner and Jakubowsky (21), in 1915, reviewed the results of treatment with mercury, arsenic, iodine, salvarsan, tuberculin, the local applications of caustics and the actual cautery, and concluded that all of them are of no value. They found that vaccine therapy was useful in treating the early stages and that it prevented the disease from spreading, but that it was useless in removing the older sclerotic areas.

In conclusion I wish to acknowledge my indebtedness to Clinical Professor S. J. Crowe, Department of Surgery, Johns Hopkins University, for assistance in several ways in the preparation of this paper. Also, I wish to thank Professor Halsted and Professor MacCallum for the privilege of reporting this case.

BIBLIOGRAPHY

1. Mayer, E. Scleroma of the larynx. Am. J. M. Sc., 1907, cxxxiii, 751-760; Rhinoscleroma in North America. Laryngoscope, 1908, xviii, 964 967.
2. Wright, J., and Strong, L. W. Some laboratory notes on the presence of the fats and lipoids in the lesion of rhinoscleroma and on variations in its bacteriology. New York M. J., 1911, xcii, 517-519.
3. Guentzer, J. H. Scleroma of the upper respiratory tract. Manhattan Eye, Ear, and Throat Hosp. Rep., 1910, xi, 148-198.
4. Pollitzer, S. Rhinoscleroma cured by X-ray treatments. J. Cutan. Dis. incl. Syph., N. Y., 1910, xxviii, 388-390.
5. Hebra, von. Ueber ein eigenthuemliches Neugebilde an der Naserhinosclerom. Wien. med. Wchnschr., 1870, No. 1, 1-5.
6. Brunner, J., and Jakubowski, C. Ueber die Behandlung des Skleroms der oberen Luftwege mittels der Autovakzine. Arch. f. Laryngol. u. Rhinol., Berl., 1915, xxix, 282-296.
7. Frisch, A. von. Zur Aetiologie des Rhinoskleroms. Wien. med. Wchnschr., 1903, xl, 251-253.
8. Guentzer, J. H. Loc. cit.
9. Babès, V. Das Rhinosklerom (Sklerom); in Kolle und Wassermann. Handb. d. path. Mikroorgan. 2d ed, vol. v, 1237-1255.
10. Perkins, R. S. Relation of the bacillus mucosus capsulatus group to rhinoscleroma, etc. J. Infect. Dis., Chicago, 1907, iv, 51-65.
11. Neumann, F. Ein Beitrag zur Klinik des Skleroms. Monatschr. f. Ohrenh. (etc.), 1910, xliv, 389-401.
12. Brunner, J., and Jakubowski, C. Loc. cit.
13. Bailey, C. H. J. Cutan. Dis., 1919, xxxvii, 447.
14. Brunner, J., and Jakubowski, C. Loc. cit.
15. Babès, V. Loc. cit.
16. Hebra, von. Loc. cit.
17. Gerber. Ueber einen Scleromherd im Ostpreussen. Berl. klin. Wchnschr., 1903, xl, 251-253.
18. Mikulicz, J. Ueber das Rhinosklerom (Hebra). Arch. f. Chir., 1877, xx, 485-534.
19. Unna, P. S. Ueber Hyaline und Bacillenhuellen im Rhinosklerom gewebe. Deutsche med. Ztschr., Berl., 1903, xxiv, 49.
20. Pollitzer, S. Loc. cit.
21. Brunner, J., and Jakubowski, C. Loc. cit.

THE SUPPORTS OF THE UTERUS[1]

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PROPOSITIONS

In a paper contributed to the Australasian Medical Congress of 1908 I submitted two propositions: (1) that the primary supports of the uterus are its ligaments; and (2) that the secondary support is the pelvic diaphragm, which tends to prevent undue stretching of the ligaments under the influence of intra-abdominal strain.

SECONDARY SUPPORT

If a normal woman under anæsthesia and in the lithotomy position vomits, the vagina being widely opened up by a speculum practically to put the pelvic diaphragm out of commission, the uterus is driven down the vagina during the effort of vomiting, and retreats to its original position when the effort ceases. If the speculum be replaced by a finger, then with each expulsive effort the levatores ani are felt to contract on to the finger and up to the uterus, rectum, and bladder as these organs are driven down toward the pelvic diaphragm. Furthermore, in cases sometimes encountered, without the slightest uterine prolapse, but with a torn pelvic diaphragm involving the *sphincter ani* and bowel (complete laceration of the perineum), similar effects are noted with the speculum, but diminished effectiveness of the pelvic diaphragm with the finger. To these experimental facts it may be added that procidentia uteri may occur with a perfectly normal pelvic diaphragm, and that uterine prolapse has been cured by shortening the strong structures at the base of the broad ligament (passing out from each side of the uterus and vagina) in cases where patients have refused operation on an accompanying torn pelvic diaphragm.

It would appear, then, that the pelvic diaphragm plays only a secondary part as a support of the uterus, and that other structures, strong and elastic, play the main part in holding the uterus in the pelvis, and are thus the primary supports of the uterus. With inefficient primary supports, a normal pelvic diaphragm does not prevent uterine prolapse; with normal primary supports, an inefficient pelvic diaphragm does not cause uterine prolapse.

PRIMARY SUPPORTS

The possible primary supports of the uterus are: (1) the mass of tissue at the base of the broad ligament extending outward on each side from the uterus and vaginal fornix (cardinal ligament of Kochs, transverse ligament of Mackenrodt); and (2) the utero-sacral ligaments.

Cardinal ligaments. Clarence Webster states that within the peritoneal covering of the broad ligaments "are fibromuscular and elastic tissues, which can be traced as bands in several places running from the uterus to the pelvic wall. The upper part of each ligament, which is freely movable, containing the tube and ovary, can have nothing to do with supporting the uterus. The lower portion is much thicker and stronger. This has been termed the *cardinal ligament* of the uterus by Kochs, and the *transverse ligament* of the cervix by Mackenrodt." According to Eden, the transverse ligaments of the cervix, "described by Mackenrodt, consist of bands of firm, fibrous tissue, which form specialized parts of the visceral layer of the pelvic fascia; arising in the neighborhood of the ischial spine, they pass through the pelvic cellular tissue and are attached to the sides of the cervix and vaginal vault." According to Jellett, "Mackenrodt's ligaments are fibrous bands inserted laterally into the cervix and upper part of the vagina." He refers to these ligaments as "specialized bands formed from the endopelvic fascia."

If all the structures attached to the uterus except the cardinal ligaments be cut away, the uterus remains supported in the pelvis. The uterus can then be drawn down the vagina only by the exercise of strong traction on the cervix, and springs back to its original

[1] Address given before Section of Gynæcology and Obstetrics, Australasian Medical Congress, 1920.

Fig. 1. Anteroposterior vertical section of the pelvis showing the pelvic diaphragm (levator ani and fasciæ). *u.s.*, Uterosacral ligament, arrow indicating the pull on the uterus; and *v.v.*, the vesicovaginal fascia of Webster.

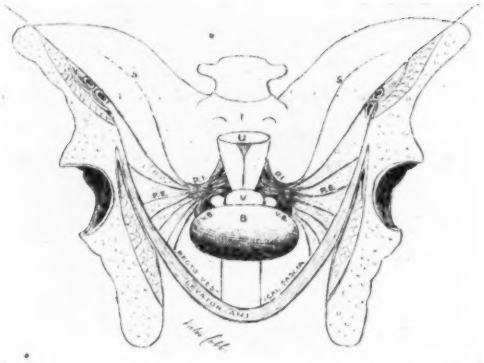

Fig. 2. Vertical section of the pelvis illustrating the relations between the cardinal ligaments and pelvic diaphragm. *u*, Uterus; *v*, vagina; *b*, bladder; *p. i.*, pars interna of the cardinal ligament; *p. e.*, pars externa; *v. b.*, vesical band; *s. s.*, fibrous strands passing up over the external iliac vessels. With intra-abdominal strain the levatores ani contract, and tighten up the pelvic fascia; this gives the cardinal ligaments a firm base to work from when they contract to prevent the uterus being driven downward; the upward pressure of the contracted pelvic diaphragm resists the downward pressure of the uterus and bladder. (Semidiagrammatic.)

position when the traction ceases. The supporting power and elasticity of the cardinal ligaments are in this way amply demonstrated.

Uterosacral ligaments (Fig. 1). If all the structures attached to the uterus except the uterosacral ligaments be cut away, the uterus sags back toward the sacrum, because their antagonist, the vesicovaginal fascia, no longer acts. When traction is then exerted on the cervix, the uterosacral ligaments are found to exercise no little resistance, although nothing like that of the cardinals under corresponding conditions. In the erect posture the uterosacral ligaments would appear, from the direction of their action, to assist in holding up the uterus, my personal view being that one of their functions is to reinforce the cardinals. Bearing on this is the fact that in lesser degrees of uterine prolapse curtailment of the overstretched uterosacrals, with remedying of retroversion, often cures the prolapse. Here the curtailed uterosacral ligaments hold up the uterus, and by giving the cardinals physiological rest encourage their contraction.

Vesicovaginal fascia of Webster (uteropubic ligaments of Schaffer and others). The uterosacral ligaments in contracting act as tensors of the vesicovaginal fascia and anterior vaginal wall; to this extent they play a part in supporting the bladder. With intra-abdominal strain in the erect posture the body of the uterus is driven down on to the bladder. As a response the action of the uterosacral ligaments tightens up the vesicovaginal fascia and anterior vaginal wall to resist the downward pressure of the uterus.

The *round ligaments*, by keeping the uterus anteverted, place it in the most favorable position for resisting intra-abdominal strain.

GENESIS

A complete understanding of the anatomy and histology of the cardinal ligaments is consistent only with a correct appreciation of their genesis. From a study of the fœtus and of the cardinal ligaments in the adult I came to certain conclusions in 1916, which will now be outlined.

In an early stage of development there is adhesion between the pelvic fascia (and posterolateral wall of the bladder) on the one side, and the embryonal uterus about the

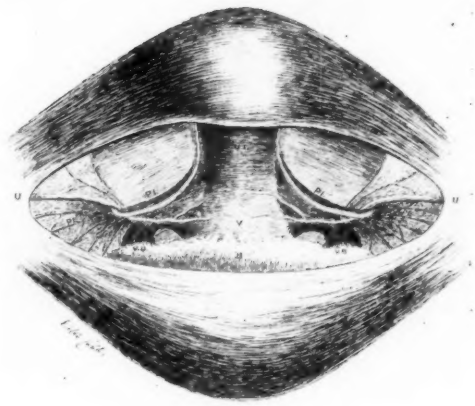

Fig. 3. The uterovesical pouch has been freely opened up, and the bladder turned down from the uterus and vagina. *ut.*, Uterus; *v*, vagina; *b*, bladder; *u.*, ureter; *p. i.*, pars interna of the cardinal ligament; *p. e.*, pars externa of the cardinal ligament; *v. b.*, vesical band. (From dissection made at the Melbourne Hospital, March 1, 1921.)

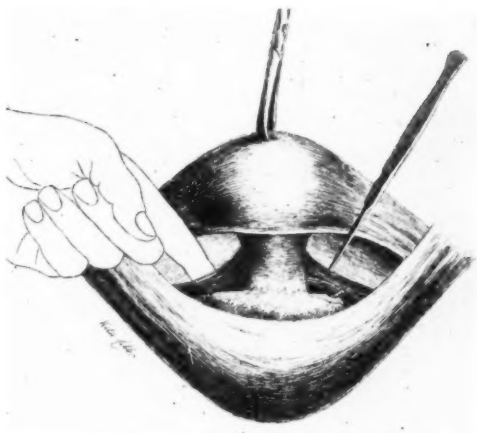

Fig. 4. The uterovesical pouch has been opened up to expose and isolate the surgical segment (pars interna) of the cardinal ligament in the operation of looping the cardinal ligament. The forefinger is behind the right segment, and an aneurism needle is passed under the left segment.

level of the future internal os (and the lateral vaginal fornix) on the other side. With retreat outward and general enlargement of the pelvic wall, the areas of least resistance in the adherent parts are drawn out into strands (muscular, fibrous, or mixed). The net result is the formation of a structure of a definite anatomical type extending from the side of the uterus and lateral vaginal fornix outward to the lateral pelvic wall, the inner segment (pars interna) being a definite fibromuscular band, and the outer segment (pars externa) consisting largely of fibrous strands spread out radiatingly. This structure is what is referred to when I speak of the "cardinal ligaments" (Fig. 2). I have adopted this term purely because of my conviction that these ligaments are the cardinal element holding the uterus in the pelvis.

The uterosacral ligaments will, I believe, be found to have a similar genesis, the presence of the rectum doubtless playing an important part in leading to the development of two ligaments. The uterosacral ligament is commonly described as a cord-like structure, but I regard this cord as the free edge of a flattened fibromuscular band.

ANATOMY

A rational surgery of the cardinal ligaments is possible only by an accurate knowledge of their anatomy. Prior to my investigations, no such accurate knowledge had, so far as I know, been attained. Bearing on this, are the statements of authorities already quoted, and, as still further bearing on it, is the report in the *British Medical Journal* of a discussion on the "Supports of the Uterus" introduced by Professor Hastings Tweedy at the Royal Academy of Medicine in Ireland on the 14th of February, 1919. Professor Tweedy stated that "The uterus owed its stability to fibromuscular bands, radiating in every direction from the muscles surrounding the os internum . . . . They acted as true tendons." Professor A. F. Dixon said the support of the uterus "was mainly applied at the lateral aspect of the cervix and at the lateral aspect of the vagina. Here the subperitoneal tissue was packed with smooth muscle and connective-tissue fibers, radiating outward along the vessels and nerves which abounded in that region. The dense mass was continuous with the muscle wall of the cervix and the vaginal fornix, and not merely adherent to these structures; in front of these, it was

continuous with the muscular wall of the lateral angle of the bladder, and formed the ureteral sheath."

The anatomy of the cardinal ligaments just quoted represents some advance on that of the pioneers, but is hardly definite enough to have any practical value for the operating surgeon. The results of my own investigations will now be described (Fig. 3).

The cardinal ligament arises by three more or less well-defined fibromuscular heads, seen in perfection at full-time pregnancy (Fig. 3). The median head corresponds to the continuation inward of the transverse part of the uterine artery, and is given off from the side of the uterus at about the level of the internal os; the superior head arises immediately above the median head, the ascending part of the uterine artery curling up over its anterior surface; while the inferior head arises from the lateral vaginal fornix. These heads converge to form a strong fibromuscular band passing outward on the posterior layer of the broad ligament. At its outer end, toward the origin of the uterine artery, this inner or surgical segment (pars interna) of the cardinal ligament spreads out radiatingly into fibrous strands (pars externa) passing through the lateral pelvic cellular tissue, and inserted mainly into the pelvic fascia. These fibrous strands are reinforced by thin sheetings of condensed connective tissue extending across the spaces between the strands and connecting the strands together.

From the inferior margin of the body of the surgical segment a strong broad fibromuscular band is given off to the posterolateral aspect of the bladder in a position corresponding with the ureter.

The surgical segment (pars interna) of the cardinal ligament has posteriorly the posterior layer of the broad ligament, to which it is adherent; anteriorly is the posterior wall of the bladder.. The transverse part of the uterine artery passes inward on the anterior surface of the body of the ligament, and then curls upward over the face of the superior head. The upper free margin of the surgical segment slopes downward and outward, while the lower margin is in relation with the posterior surface of the bladder. The ureter dips forward from the posterior layer of the broad ligament to pass beneath the outer end of the surgical segment, and then swings into the bladder.

SURGERY

The foregoing investigations have permitted me to work out a scientific operation for uterine prolapse, as well as to render the operations of hysterectomy and parametric ureterotomy simple and safe.

Looping the cardinal ligaments. At the Australasian Medical Congress, of 1914, I described my operation of "Looping the Cardinal Ligaments" in uterine prolapse. The anatomical portion of the paper was illustrated by a beautifully dissected specimen made under my direction in the Melborune Hospital by Dr. C. Kellaway, who later was acting Professor of Anatomy in the Adelaide University, while the operation was illustrated by 5 successful cases. The first case was operated on July 9, 1913, and remains cured in the presence of an active life.

The operation is carried out through an abdominal incision, the utero-vesical pouch being freely opened up, and the bladder turned down from the uterus and vagina. The upper free margin of the surgical segment of the cardinal ligament is then defined, and the ligament bluntly dissected from the posterior layer of the broad ligament (Fig. 4). The uterine artery is now seen coursing along the anterior surface of the ligament, while the ureter may be seen and felt without difficulty. A threaded curved pedicle needle is passed under the lower margin of the ligament, a loop of the ligament drawn forward by the thread, and the base of the loop sewn down to the lateral aspect of the uterus.

For associated retroversion I graft on my operation of "Restoration of the Round Ligaments": the anterior layer of the broad ligament is split parallel to the round ligament, and the opening closed with a purse-string, thereby bringing about immediate contraction of the round ligaments. The free ends of these purse-strings are used to close the original opening in the uterovesical pouch. The uterosacral ligaments are then curtailed, while a torn pelvic diaphragm should be repaired.

Hysterectomy. The crux of the operation is the exposure and isolation of the surgical segments of the cardinal ligaments, as described. They are caught in clamps to control the uterine arteries, and the broad ligaments are clamped to control the ovarian and round ligament arteries. The cardinal ligaments and broad ligaments are divided internal to the forceps, Douglas' pouch opened up, the uterosacrals divided, and the vagina cut across. The stumps on each side are secured by a continuous ligature, the free ends being used to close the rectovesical gap. The actual hysterectomy requires only four forceps and two ligatures.

Parametric ureterotomy. The surgical segment of the cardinal ligament is exposed, and, if necessary, isolated. A stone in the ureter may then be extracted, a stab incision for drainage made into the vagina, and the uterovesical opening very carefully closed.

CONCLUSIONS

The facts submitted in this article, and the results obtained in uterine prolapse by operative treatment based on those facts justify me, I believe, in claiming that the opening propositions in regard to the supports of the uterus must stand as a satisfactory guide in surgical practice, while at the same time representing the solution of an important problem.

For the photographs of my drawings I have to thank Dr. Barker, Chief Resident Medical Officer, Perth Hospital.

REFERENCES

Looping the cardinal ligaments in uterine prolapse. Ann. Surg., 1914, April; Tr. Austral. M. Cong., 1914.
Restoration of the round ligaments. Lancet, 1915, July 31.
Observations on uterine displacements. Surg., Gynec. & Obst., 1916, xxii, 105.
Genesis of the cardinal ligaments. Med. J. Australia, 1916, Aug. 26.
Prolapse of the female bladder. M J. Australia, 1917, March 31.

ADENOMYOMA OF THE FALLOPIAN TUBE

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VON RECKLINGHAUSEN, in 1896, advanced the theory that adenomyomata of the fallopian tube originate in the wolffian body, since in 27 cases the histological picture resembled that of the primodial kidney. In only two instances could he trace any relation of the adenomyoma to the mucosa of the tube. The first case he explained as due to a rupture of the gland into the tube lumen; and the second, as a continuation of a union between a wolffian duct and a muellerian duct. His hypothesis completely overthrew the generally accepted opinion of the muellerian duct origin of tubal adenomyoma.

Kossmann, in 1897, demonstrated that the tube could supply gland elements, and that in a small number of cases he found the glandular inclusions in tubal adenomyoma derived from accessory tubes. He, therefore, advanced the hypothesis that these adenomyomata arise from the accessory muellerian ducts.

Chiari, in 1887, concluded that 6 of 760 specimens with tubal swellings which he examined postmortem were not tumors in the strictest sense of the term, but in reality products due to a chronic catarrh of the genital system. In one tube he saw signs of a recent inflammation, from which he concluded that the inflammatory condition in the remaining five had subsided.

Von Franque, in 1900, showed that the epithelial structures of the tubal adenomyomata are derived from mature mucous membrane by a process of inflammation. He found adenomyomata in cases of partially healed tuberculous salpingitis, and in cases showing chronic inflammation of the tube wall. Likewise Meyer, in 1903, found similar processes of inflammation in cases of tubal adenomyoma. Many of his cases were associated with tuberculous and gonorrhœal salpingitis, hydrosalpinx, and ovarian diseases.

Maresch, in 1908, investigated the origin of what he termed *salpingitis isthmica nodosa*, or

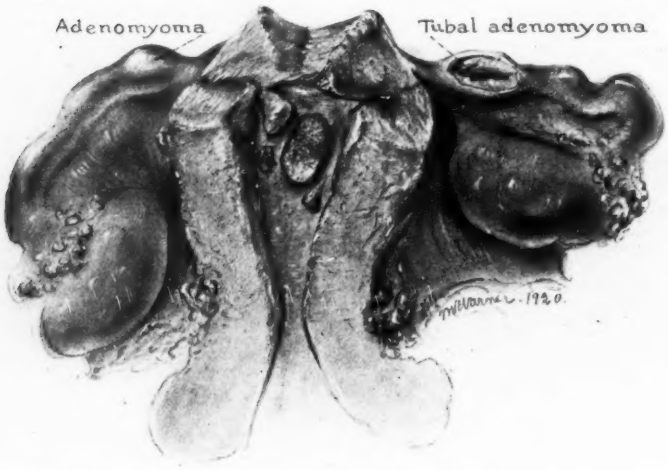

Fig. 1. (180378) The usual location of tubal adenomyomata is the proximal end of the tube.

adenomyomatous structures in the tubal angle. He relied on a large number of serial sections and also used the method of injecting the tubes. He was able by these methods to trace the origin of the adenomatous structures from mature tubal epithelium. In some tubes which showed an extensive glandular infiltration of the tube wall he was able to trace only one point of origin from the tubal mucosa. This explains why in a certain percentage of tubal adenomyomata no origin can be determined.

Cullen, in 1908, was able to trace the origin of adenomyomata of the uterus from mature uterine endometrium in practically every case he had studied, showing that a wolffian or muellerian duct could not be the origin of uterine adenomyomata.

From the findings of these later authors it seems strange that the hypotheses of von Recklinghausen and Kossmann gained such a foothold that even at the present time thay are incorporated in some textbooks.

The twenty-three cases of adenomyoma of the fallopian tube herewith reported were found at operations in the Mayo Clinic between January, 1910, and July, 1920. During this time 4,189 fibromyomatous uteri were removed, of which 332 (7.9 per cent) contained adenomyomata. This percentage is somewhat higher than that of Cullen's in 1908 (5.7 per cent) and of MacCarty and Blackman in 1919 (6.43 per cent). The increase is due no doubt to the added interest aroused by these writers on the subject. Twenty-three (6.92 per cent) of the 332 uteri contained tubal adenomyomata. In 14 (60.8 per cent) of the 23 we were able to trace a direct origin from mature tubal epithelium. In 6 cases, adenomyomata and tuberculous salpingitis were associated. In these the tuberculous granulation tissue in the tube lumen could be traced in to the tube wall surrounding the adenomatous structures. In three cases no direct continuation from the tubal mucosa could be demonstrated, but serial sections through the entire tube on the uterine side showed the absence of any gland structure. From this we conclude that the origin is most probably from the tubal mucosa, but due to the inadequacy of our methods of sectioning no direct point of origin from the tubal mucosa could be found. These latter cases are perhaps similar to those reported by Maresch who by means of very careful injection was able to trace but one point of origin from the tubal mucosa in a small percentage of his cases.

Fig. 2. Fig. 3. Fig. 4.

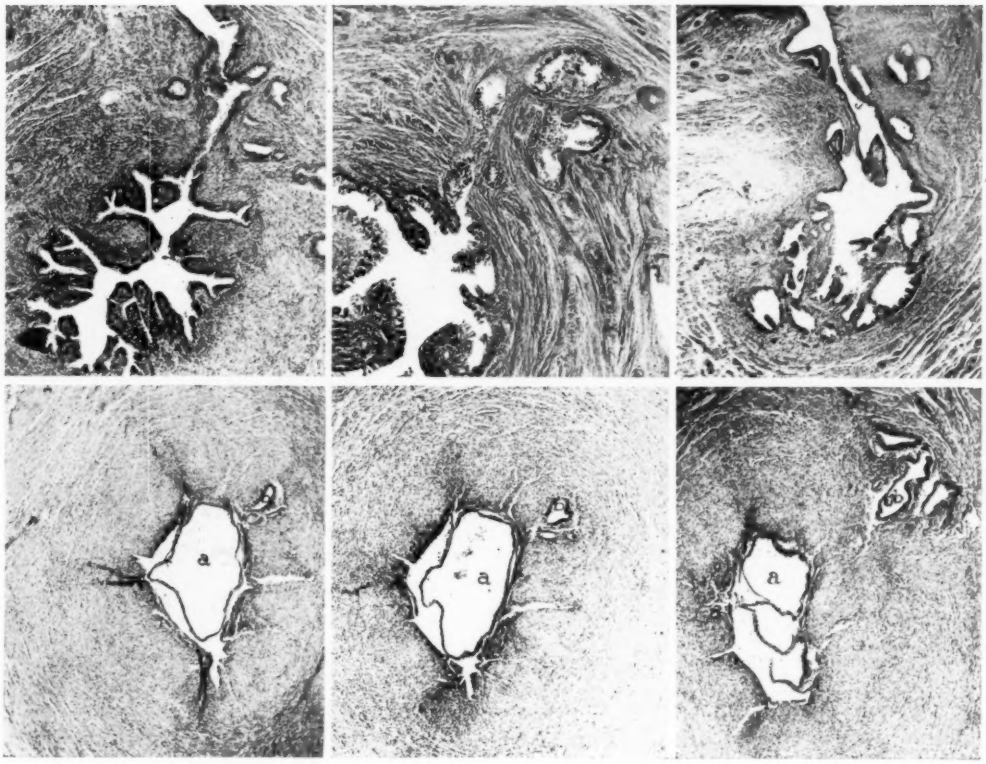

Fig. 5. Fig. 6. Fig. 7.

Fig. 2 (248153) and Fig. 3 (186669). Gland structure of an adenomyoma arising from mature tubal epithelium.

Fig. 4. (268280) The origin of a tubal adenomyoma and an associated subacute salpingitis.

Figs. 5, 6, 7. (180378) Photomicrographs of a series of sections showing, *a*, the origin of an adenomyoma of the tube from the epithelium of the tube lumen, and, *b*, the invasion of the tube wall (see Figure 1).

Of the 23 cases reported, 5 were associated with acute salpingitis, 6 with tuberculous salpingitis, 1 with hæmatosalpinx, 1 with hydrosalpinx, 1 with ectopic pregnancy, and 1 with papillary carcinoma of the ovary. One of the patients with acute salpingitis had been treated for a gonorrhœal infection 6 years previously.

All the specimens which were examined showed some evidence of an inflammatory reaction, from a moderate lymphocytic infiltration in some part of the tube to an acute purulent salpingitis. Other signs of pelvic inflammation, such as cystic ovaries, tarry cysts, and pelvic adhesions, were found in the remainder of the cases.

Grossly, these tumors are situated in the proximal end of the tube and isthmus, and appear as small swellings varying from a slight, scarcely noticeable, thickening of the wall of the tube, to a mass 1 centimeter to 2 centimeters in diameter (Fig. 1). The process, as a rule, is circumscribed, though in one case it extended through the entire length of the tube.

The cut surface is fibrous and gray with here and there small glistening areas which microscopically are gland spaces. The areas of old

Fig. 8. Fig. 9. Fig. 10.

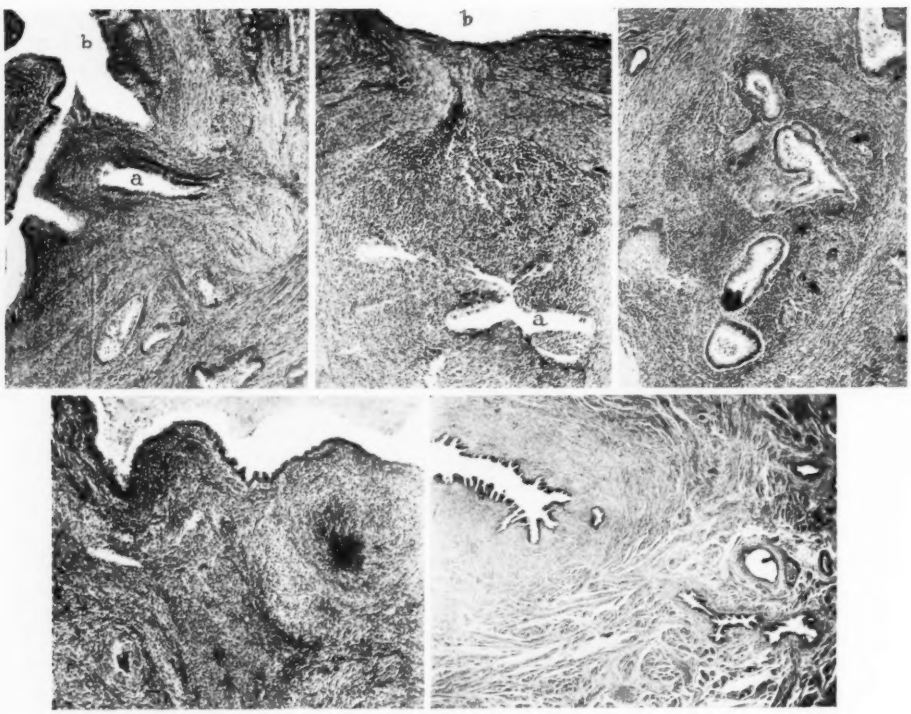

Fig. 11. Fig. 12.

Fig. 8. (310572) Adenomyoma of the tube with an associated acute salpingitis. The gland structure, *a*, is breaking away from the tube lumen, *b*, carrying with it muscle fibers from the inner longitudinal muscle.

Fig. 9. (310572) Adenomyoma of the tube associated with an acute salpingitis, showing tube lumen, *a*, with a hyperplastic cellular mantle confluent with that surrounding the adenomatous structure, *b*. This is a section of a series taken adjacent to section shown in Figure 8.

Fig. 10. (103082) Adenomyoma of tube associated with tuberculosis.

Fig. 11. (73421) Adenomyoma of tube associated with tuberculosis.

Fig. 12. (73421) Adenomyoma of tube and a tuberculous salpingitis in other portions of the tube (see Figure 11).

hæmorrhage that are frequently noted in uterine adenomyomata are not seen.

Twelve (52.1 per cent) of the adenomyomata were bilateral, 7 (30.4 per cent) were on the right side, and 4 (17.4 per cent) on the left.

Histologically the glandular structures of tubal adenomyomata are immediately surrounded by smooth muscle fibers (Figs. 2 to 12). The cellular mantle, so common in uterine adenomyomata, is either absent entirely or only very thin. This may be due to the fact that the tubal adenomyomata arise in the proximal end of the tube where the tube lumen is closely surrounded by smooth muscle.

The average age of our patients was 37½ years, the eldest 64 and the youngest 17 years. A history of previous pelvic infection was noted in 34.7 per cent of the cases. Eighteen (78.25 per cent) of these patients had never given birth to living children and 15 (65.2 per cent) had never been pregnant. Of the 5 patients who had living children, 2 had been pregnant 23 and 24 years previously and one, aged 50, had in association with the adenomyoma a papillary carcinoma of the

ovary which had transplanted itself into the tube. Only 2 patients of the 23, therefore, aged 29 and 32 years, apparently have had normal pregnancies.

Ninety-one and three-tenths per cent of the patients gave a history of abdominal pain and 43.4 per cent complained of a vaginal discharge. The average duration of symptoms was 31.3 months. No other definite clinical symptoms were noted.

CONCLUSIONS

1. The term "tubal adenomyoma" is a correctly applied term to adenomyomata arising in the tube, since the origin of the glandular portion is from the mature epithelium of the tube.

2. The hypotheses of the origin of tubal adenomyomata from the wolffian and muellerian ducts are untenable.

3. Tubal adenomyomata are in every case associated with an inflammatory condition and most probably are end products of the process of inflammation.

4. Some relation exists between sterility and the presence of adenomyomata of the fallopian tube.

5. There are some slight histological differences between tubal adenomyomata and those commonly found in the uterus, but this difference is most probably due to the place of origin and subsequent development and not to the etiological factor.

BIBLIOGRAPHY

1. CHIARA, H. Quoted by Lockyer, Fibroids and allied tumors (myoma and adenomyoma) their pathology, clinical features and surgical treatment . . . with an introductory note by Alban Doran. London: Macmillan, 1918, p. 307.
2. CULLEN, T. S. Adenomyoma of the uterus. Philadelphia: Saunders, 1908, 270 pp.
3. v. FRANQUE, O. Salpingitis nodosa isthmica und Adenomyoma tubæ. Ztschr. f. Geburtsh. u. Gynaek., 1900, xlii, 41–58.
4. KOSSMANN, R. Die Abstammung der Drueseneinschluesse in den Adenomyomen des Uterus und der Tuben. Arch. f. Gynaek., 1897, liv, 359–383.
5. MACCARTY, W. C., and BLACKMAN, R. The frequency of adenomyoma of the uterus. Ann. Surg., 1919, lxix, 135.
6. MARESCH, R. Ueber Salpingitis nodosa. Berlin: Karger, 1908, 72 pp.
7. MEYER, R. Ueber adenomatoese Schleimhautwucherungen in der Uterus und Tubenwand und ihre pathologisch-anatomische Bedeutung. Arch. f. path. Anat., 1903, clxxii, 394–409. Quoted by Lockyer, Fibroids and allied tumors (myoma and adenomyoma), their pathology, clinical features and surgical treatment . . . with an introductory note by Alban Doran. London: Macmillan, 1918, p. 284.
8. v. RECKLINGHAUSEN, F. Die Adenomyome und Cystadenome der Uterus und Tubenwandung; ihre Abkunft von Resten des Wolffschen Koerpers. Im Anhang: Klinische Notizen zu den voluminoesen Adenomyomen des Uterus, by W. A. Freund. Berlin: Hirschwald, 1896, 247 pp.

SUCCESSFUL END-TO-END SUTURE OF THE COMMON CAROTID ARTERY IN MAN

By HARRY G. SLOAN, M.D., F.A.C.S., Cleveland

SUTURE of the common carotid artery appears to have been one of the rarest of operations since, in a careful study of the literature, the author has been able to find but eight cases, each occasioned by an aneurism. Dr. V. Parczewski (1) records a case of arteriovenous aneurism of the common carotid in a man of 21 in which the vessel was closed by a circular suture after the removal of about 2½ centimeters. No neurological symptoms followed. He states that a careful study of the literature has led him to believe that this is the first case of its kind recorded.

H. von Haberer (2) reports one case of lateral suture of the common carotid for aneurism out of a total of 42 operations for aneurism, and 4 cases of circular suture for aneurism following war wounds.

I exer (3) records a case of traumatic aneurism involving both the artery and the vein in which a resection of 3 centimeters of the common carotid was made. The age of the patient is not stated. "During the operation the common carotid was closed for 1 hour. Paralysis of the opposite leg cleared up the same evening, whereas the paralysis of the arm on the same side took 4 weeks to disappear." The author explains this difference as due to the inverted localization in the cortex, the motor centers for the foot and leg being nearer the mid-line of the cerebrum than the arm center, so that the former derived some collateral circulation from the opposite hemisphere.

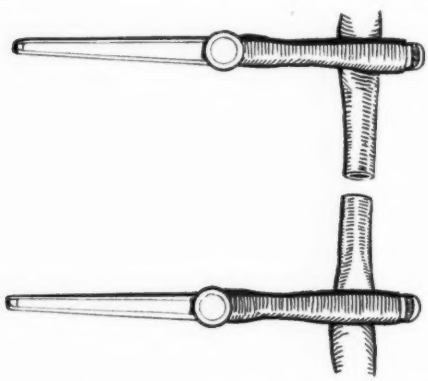

Fig. 1. Ends of the artery have been stripped of adventitious tissue and are ready for the placing of guy sutures.

Dr. W. Denk (4) reports a case of aneurism of the left common carotid in a soldier of 20 years, in whom he united the vessel by a circular suture after the removal of 2 centimeters. This case is of especial interest as it is the only one of the eight reported cases in which the presence and continuance of pulsation in the temporal artery on the side of the resection was noted.

Experimental findings have shown that the recovery rate after ligation of the common carotid is 33 per cent. It follows, therefore, that survival does not necessarily prove that the carotid is patent after circular suture, especially in young patients, unless the temporal pulse is demonstrated.

Our patient, aged 56, presented himself in July, 1920, with a recurrent carcinoma of the lower lip and neck. The primary lesion was a squamous-cell carcinoma of the left lower lip which had been operated on elsewhere. Three months before, Dr. Crile had excised the gland-bearing area of the left side of the neck and the lower triangle of the right side, the latter excision necessitating the resection of 1.5 centimeters of the internal jugular vein on account of the invasion of its wall by the new-growth, extending from an infected gland at the junction of its middle and lower thirds.

The plan of the final operation was to clean out the superior triangle on the right side as there was an enlarged gland just at the angle of the jaw. During the sharp knife dissection in the deep planes of the neck, where the previous excision of the inferior jugular vein had occurred, we nicked the common carotid as it lay in a mass of scar tissue. In the attempt to catch the supposed spurter, the carotid was caught with a hæmostat which immediately cut through the sclerosed vessel walls. Before the bleeding was controlled by finger compression above and below the bleeding, the vessel wall was badly damaged by hæmostats for about three-fourths of a centimeter, the damaged portion encroaching on about half of its circumference.

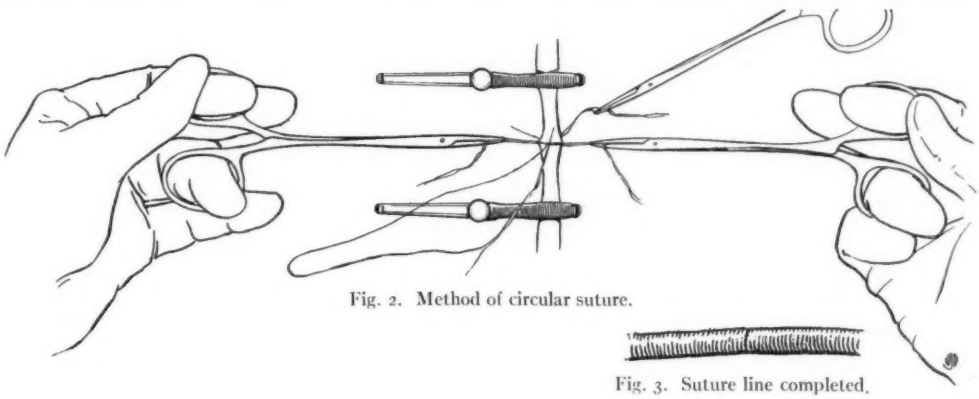

Fig. 2. Method of circular suture.

Fig. 3. Suture line completed.

We fully appreciated the danger to life at this age if the common carotid were ligated. Twelve years previously I had helped Dr. Crile in the excision of the left external and internal common carotids in a man of 28 who was suffering from an endothelioma of the common carotid gland, which had invaded the vessel walls. Following the operation he was delirious for 3 days. His right leg was weak and dragged for 5 weeks, but ultimately recovered its full strength. Clinical experience has taught that the older the patient, the greater the danger from ligation of the common carotid artery because of the greater difficulty in maintaining efficient collateral circulation through the more rigid vessels.

In regard to the repair of the vessel, we have found it easier to do an end-to-end anastomosis than to make a lateral repair of the vessel wall. Moreover, in this instance a lateral repair of the vessel wall would cut down the blood supply to that side of the brain by probably two-thirds. In addition there is evidence that a thrombus will more probably be formed distal to a lateral suture of a blood vessel. This is because of the greater opportunity for stasis in the peripheral back eddy of the blood stream just after it passes a constricted point in the vessel lumen. We, therefore, decided to excise the damaged area of the vessel and make an end-to-end anastomosis. After making an ample exposure of the artery, we clamped off the vessel proximally and distally to the rent with carotid clamps which had their jaws protected with rubber tubing. The damaged area of the vessel, 8 millimeters in length, was excised; and the loose tissue was cleaned off from the cut ends (Fig. 1). In order to approximate the divided artery without tension, we raised the patient's head on a small pillow and then rotated it on the longitudinal axis of the body, fifteen degrees away from the side on which we were operating. In other words we turned the man's face toward his left, and at the same time approximated the head and right shoulder. The patient had a rather heavy neck so it was difficult to get sufficient room in which to work as we had to make our suture in the vessel only about 4 centimeters above the clavicle. However, by using a mosquito hæmostat for a needle holder, we succeeded in placing the sutures. We employed Carrel's original method of

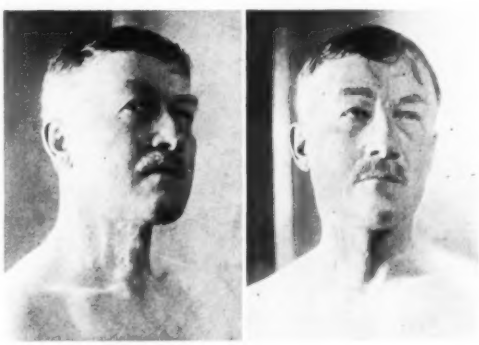

Fig. 4. Patient after operation.

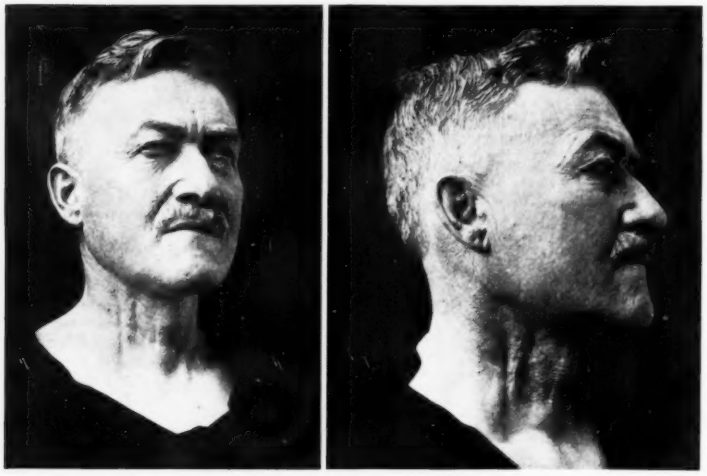

Fig. 5. Patient five months after operation.

suture, i.e., three guy sutures through all the coats of the vessel, and then a continuous over-and-over suture, joining the cut ends of the vessel (Fig. 2). We used straight No. 16 needles and triple ooo linen, split twelve times. Needles and sutures were well lubricated with vaseline. The approximation of the cut ends of the vessel was made by traction on the successive guy sutures.

On account of the proximity to the clavicle and the shortening of the blood vessel, the most difficult part of the suturing was on the posterior aspect of the vessel between the first and third guy sutures. Moreover, the vessel wall was quite sclerosed, and had very little elasticity. The patient had a moderate degree of sclerosis of his large vessel and at the time of operation his blood pressure was 156 millimeters mercury systolic, and 100 millimeters mercury diastolic. It was possible to peel off a ring from the cut end as one would uncurl the end of a coiled spring. In removing the distal carotid clamp when the suture line was finished, we found two places from which fine streams of blood spurted. A single stitch at each of these points made an absolutely tight suture line that allowed no leakage whatever. The suture line was further protected by pulling the deep fascia over it and stitching it in place (Fig. 3).

After the repair of the carotid artery was completed we proceeded with the dissection of the neck. The gland-bearing area of the superior triangle was excised *en bloc*, and the skin closed with clips. During the operation, the circulation was cut off from the right side of the brain for 30 minutes; but on completion of the operation, we were able to feel pulsation in the temporal artery on the side of the sutured carotid. The second day after the operation the pulsation in the right temporal artery was of about half the volume of that of the opposite side. However, on the third day, the pulsation on the two sides was of equal volume, and has so continued ever since. Recovery from anæsthesia was not delayed, and at no time since the operation have there been any nervous symptoms or any abnormal response in the deep reflexes of the opposite side of the body, nor has there been any change in mentality. The patient made an uninterrupted convalescence and has been at work for the last two months (Fig. 4).

REFERENCES

1. von Parczewski. Muenchen. med. Wchnschr., 1916, lxiii.
2. H. von Haberer. Wien. klin. Wchnschr., 1918, xxxi, No. 10, 285.
3. Lexer. Muenchen. med. Wchnschr., 1918, lxv, 468.
4. Denk, W. Wien. klin. Wchnschr., 1918, xxxi, 285.

ABDOMINAL PREGNANCY WITH LIVING CHILD

By E. C. MOORE, M.D., F.A.C.S., Los Angeles, California.

THERE are many cases of abdominal pregnancy on record where the fœtus has been found either dead or only a few months old. The number of cases going to term with delivery of a living child are much less numerous, while those where the mother survived and the child lived a year or more are exceedingly rare.

Kelly, in his *Operative Gynecology*, 1898, gives a table of 77 cases of ectopic viable fœtus delivered under cœliotomy from November, 1809, to November, 1896. Thirty-five of these infants died within 50 hours of birth and only 7 are recorded as having lived for one year or more. Probably more than seven, however, survived because the data on this point seem to be incomplete.

The object of this paper is to put our case on record, and to mention a few cases which have been found in the literature where it is positively certain that the mother survived and the child lived for at least one year.

The first four cases have been taken from Kelly's table. In order to identify these cases the operator's name is given.

1. Treub. Operation, May 29, 1887. Mother recovered. Child well at seven and one-half years.

2. Olshausen. Operation, November 1, 1888. Mother recovered. Child well at one year.

3. George Rein. Operation, February 4, 1890. Mother recovered. Child living in 1894.

4. M. Price. Operation, October 23, 1892. Mother recovered. Child well in 1897.

5. Horsley (4) mentions Lockett's case where the mother recovered and the child was living 20 months after operation.

6. J. S. Horsley (4). Operation, December 13, 1911. Child found among the intestines, covered only by a thin membrane. The placenta and sac had a distinct pedicle coming from the left broad ligament. The baby was a well formed boy weighing 6 pounds. Mother and child were both well more than a year after the operation.

Sittner (7) has made a very comprehensive survey of the literature on this subject and has collected 179 cases of extra-uterine pregnancy with viable fœtus delivered by cœliotomy. He has written three articles on this subject, in the first one of which he collected 121 reported cases taking in the years 1813 to 1900. In his second article he adds 15 more cases, bringing his statistics up to 1902. His third article comprises 43 additional cases found from 1902 to April 19, 1906, making in all 179 cases. Some of these fœtus had not gone to term, but there were 122 which were more than 32 weeks old. Fifty-nine of them, or 48.3 per cent died, within 4 weeks of delivery, showing that 51 per cent of these children lived more than 1 month. There are eight cases among those last collected by Sittner which conform with the requirements of this paper. Only the briefest possible reference to each case will be made because those who are especially interested can easily obtain Sittner's original article.

7. A. Benckiser, Karlsruhe. Operation, February, 1899. Mother survived. Child (male) living in 1906. (Case No. 11.)

8. A. Fischer, Tiflis. Operation, October 4, 1902. Mother survived. Male child died at the age of 2 years. (Case No. 24.)

9. G. Calderini, Bologna. Operation, June 12, 1903. Mother survived. Child, female, living in 1906. (Case No. 27.)

10. H. Schmit, Linz. Operation, July 17, 1903. Mother survived. Male child living in 1906. (Case No. 28.)

11. R. Chrobak, Vienna. Operation, November 17, 1903. Mother survived. Female child living in 1906. (Case No. 33.)

12. D. Popoff, St. Petersburg. Operation, September, 1904. Mother survived. Male child died at the age of 15 months of intestinal catarrh. (Case No. 35.)

13. Th. Landau, Berlin. Operation, March 20, 1905. Mother survived. This child, male, was under Sittner's personal observation and at the age of 2 years was reported by him as living and well. (Case No. 39.)

14. J. Jerie, Prague. Operation, September 12, 1905. Mother survived. Female child reported to be living on November 27, 1906. (Case No. 42.)

15. F. A. Dorman's (2) case operated April 25, 1917, within 1 week of term. The sac was found to be connected with the right broad ligament. Uterus was the size of a 3 months' pregnancy, contained four fibroids, and had a large pedunculated fibroid attached to the left horn and a small one to the right horn. The child was a girl weighing 6 pounds and 14 ounces. The mother recovered.

16. F. A. Dorman's second case, operated upon November 17, 1917, 12 days before estimated term. This case, like the preceding one, was intraligamentous, the attachment being to the left broad ligament. A living baby girl weighing 4 pounds and 11 ounces was delivered. The mother recovered. In a letter received from Dr. Dorman, dated November 2, 1920, he writes: "Up to reports of very recent date both of the ectopic babies reported by me were in excellent health and developing normally."

17. N. L. Hood (3). Operation, December 22, 1909. A living girl baby weighing 7½ pounds was removed from the sac. There was a concavity on the left side of the child's head caused from resting against the vertebral column. The sac was between the layers of the right broad ligament, the placenta lying partly on its anterior wall and partly on the uterus. The mother recovered, but had to have a secondary operation for a sinus which extended down into the pelvis. This closed in August, 1912. The child at the age of 3 appeared normal in every way.

18. Horsley (5) in his second article mentions the following two cases. C. Adjaroff's case. Mother and child perfectly well two years after operation.

19. Potocki's case. Mother recovered. Child was living at 2½ years of age, but was deaf and dumb.

20. Dubose's case mentioned by Lee (6) deserves especial attention, as it seems safe to say it probably is the only one of its kind. A negress, 35 years old, had given birth to an apparently full-term baby. The midwife who confined her recognized the presence of twins, and not being able to effect a delivery of the second child, sent for aid. A diagnosis of abdominal pregnancy with viable fœtus was made and the patient operated upon the next day. A large right ovarian amniotic sac was found with pedicle from the top and upper posterior surface of the right broad ligament. This was ligated and the entire sac and placenta removed. The extra-uterine child weighed 2 ounces more than the intra-uterine child. The convalescence was uneventful and the mother and both children were normal 22 months later.

The history of my case is as follows:

The patient, Mrs. N., 29 years of age, was pregnant for the first time, although she had been married for more than 5 years. Her last menstruation came on March 12, 1915, but was not normal, as she flowed only 1 day, whereas the flow usually continued about 5 days. Shortly after this she began to have morning nausea and enlargement of the breasts. For about 6 weeks the pregnancy seemed to progress normally, then she began to have severe cramplike pains in the lower abdomen. These pains came and went for about 2 weeks, when early one morning she was seized with excruciating pains in the lower abdomen, more pronounced on the right side. She felt very faint and had to vomit. Her attending physician advised an operation at this time. She remained in bed for 10 days, occasionally having a great deal of pain, which gradually became less severe. Quite frequently between the second and third months there was a slight bloody vaginal discharge. During the sixth month of pregnancy she had very little pain, but from that time on she vomited a great deal and the fœtal movements caused much pain. On November 12, 1915, her physician, Dr. Speicher, decided something must be done to relieve her and asked Dr. M. L. Moore to see the patient in consultation. Upon examination, the position of the child seemed abnormal, the cervix small and undilated, so an abdominal operation was advised. The patient would not consent to this until November 27, 1915. At operation, I found the omentum and small intestine adherent to the anterior abdominal wall, which, after separating, showed a large mass covered by small intestine and omentum, showing recent inflammation and covered with lymph. The mass had the appearance of a twisted pedicle cyst. The veins in the omentum were decidedly enlarged. The uterus was about the size of a 3 months' pregnancy and was pushed to the left by this mass. The mass was attached to the posterior surface of the right broad ligament and to the lateral pelvic wall and also extended up toward the liver, being attached to the omentum in this region. The colon was free from any attachment. The cord from the placenta extended to the left up under the spleen where the child was found free among the intestines, not surrounded by any sac. The intestines on the right side were more or less adherent to one another, due to the fact that the membranes were adherent here to the coils of intestine. Clamps were placed on the broad ligament below the attachment of the placenta and the entire broad ligament with placenta was removed *en masse*. The child was a girl weighing 5 pounds and 9 ounces and had no deformities. In a letter received from the mother, dated November 12, 1920, she states that both she and her little daughter are well.

This makes 21 authentic cases and undoubtedly many others could be included if it were possible to obtain the necessary information. Cragin's (1) five cases illustrate this point. The five mothers operated upon by him made good recoveries. Two of the infants were dead at the time of operation and the remaining three left the hospital in good condition. One was reported normal at the age of 5 months. Because of Dr. Cragin's death it has been impossible to learn the fate of these three children.

BIBLIOGRAPHY

1. Cragin, E. B. Full-term ectopic gestation with living child. Am. J. Obst., 1914, lxx, 1019.
2. Dorman, F. A. Two cases of abdominal (ectopic) pregnancy operated upon near term with living children. Am. J. Obst., 1919, lxxix, 782.

3. Hood, N. L. A case of full-term living child removed by laparotomy in an extra-uterine pregnancy. Lancet, 1913, clxxxiv, 1662.
4. Horsley, J. S. Abdominal pregnancy with a living child. Surg., Gynec. & Obst., 1913, xvii, 58.
5. Horsley, J. S. Abdominal pregnancy with living child. Surg., Gynec. & Obst., 1913, xvii, 767.
6. Lee, W. G. Advanced extra-uterine pregnancy with living child; primary laparotomy. Surg., Gynec. & Obst., 1917, xxiv, 317.
7. Sittner, A. Ergebnisse der in den letzten 20 Jahren durch Koeliotomie bei lebendem Kinde operierten Faelle von vorgeschrittener Extra-uterinschwangerschaft. Arch. f. Gynaek., 1907, lxxxiv, 1-98.

THE WEAK SPOT IN AMERICAN SURGERY[1]

By THOMAS S. CULLEN, M.D., F.A.C.S., Baltimore

TO the outside world the members of a well regulated family usually present an unbroken front amid the cares and turmoil of a busy life. In the bosom of the family, however, all reserve is removed, and the various members feel themselves free to discuss one another's shortcomings and proffer suggestions as to the ways by which betterments may be made.

As members of the College of Surgeons we are in reality members of a large surgical family and it is not only our privilege but also our duty to speak out freely in these family gatherings, and to suggest means whereby the surgery of these United States and Canada may be improved.

When our distinguished colleague, Dr. Franklin H. Martin, who, more than any other man has been instrumental in the advancement of the College of Surgeons, asked me to speak at this state meeting I gladly consented, and in casting around for a suitable topic one subject kept continually presenting itself—*The Weak Spot in American Surgery*.

When we survey the surgical field and see what has been accomplished in abdominal surgery, in gynecology, in the surgery of the neck and recently of the brain, and remember how orthopedic surgery and surgery of the nose and throat have advanced we are naturally filled with pride. But let us not for a moment forget that the advancement along these lines has in large measure been rendered possible as a result of the fundamental labors of Pasteur, Lister, Koch, and a few others. Had it not been for the epoch-making discoveries of these men our remarkable advances in surgery would not have been possible.

Bacteriologists have not only shown us the way but have also in large measure removed the nightmare of tetanus by giving us a curative antitoxin.

SURGICAL PATHOLOGY

In some of the larger hospitals there has been a very close co-operation between the surgeon and the pathologist for the last 25 or 30 years. In these hospitals the surgical cases have been carefully described, the surgical procedures have been given in detail, the material removed has been examined macroscopically and microscopically, the immediate and after-results have been recorded with precision, and finally, the composite picture of the given surgical disease has been followed from beginning to end. In other words, the sap has been collected, boiled down, and we have the sugar. The results of long years of observation and study have been concentrated into definite concrete surgical facts.

Those of you who have had the pleasure of being in the sugar bush know that it takes barrel upon barrel of sap to make a relatively small amount of sugar. It has taken an infinite amount of labor and many observations to establish a few certain surgical facts, facts of inestimable value not only to the surgeon but also to the patient.

THE ADVANTAGES THE SURGEON HAS OVER THE PATHOLOGIST

The surgeon, when he opens the abdomen, sees the exact relation of the diseased area to the surrounding tissue. On the other hand, when the pathologist receives the specimen this setting has often entirely disappeared.

[1] Address before Texas and Oklahoma State Sections, Clinical Congress of American College of Surgeons, Dallas, January 7; and before the Members of Louisiana and Mississippi State Sections, New Orleans, January 10, 1921.

For example let us take a fallopian tube that has been converted into a hydrosalpinx, 3 centimeters in diameter, and that is adherent to the pelvic floor. While the tube is being loosened, its fimbriated end may rupture and the fluid escape. Such a tube when it reaches the pathologist may not be much larger than a normal tube and apart from a few adhesions the pathologist finds nothing wrong. How impossible it is for him to form an adequate idea of what was really found at the time of operation.

Again, let us take the specimen from a chronic appendicitis. The acute inflammation has subsided and at operation the appendix is normal in size but buried in adhesions. And yet, despite the fact that the patient has been relieved by an appendectomy, the pathologist may find little or nothing to indicate why it was necessary to remove the appendage.

Again, the manipulation during the operation may totally alter the form and relation of the structures removed. Let us take a case of pelvic inflammatory disease with dense adhesions. The operator sees the exact relation. If a bisection has been done and each half of the uterus has been removed separately and then the tubes and ovaries tied off on each side, the pathologist receives four pieces of tissue which are with difficulty replaced in their normal relation.

Those of you who have used the binocular microscope have noted how graphically the three dimensions are brought out. With two eye-pieces you focus down on the one object. Now let us suppose that the surgeon looks through one eye-piece, and the pathologist through the other, neither can possibly get the full value of the picture. Metaphorically speaking, if the surgeon wishes to get an adequate picture he must use both the eye-pieces —in plain English he must be not only a surgeon but also a good pathologist.

WHAT A KNOWLEDGE OF PATHOLOGY MEANS TO THE SURGEON

Frequently the surgeon on opening the abdomen is in a quandary as to what he should do next. He sees one or more suspicious areas and says to himself: "If I only knew exactly what these areas were I would go ahead or back out." In such cases he usually closes the abdomen without doing anything. On the other hand, the surgeon who is a good pathologist has on previous occasions been in just such a dilemma but from frozen sections of the tissue has been able to determine the exact condition, and has either operated or desisted as the case might be. After a few such experiences he is often able to determine with relative certainty the actual condition from visual inspection, while in the doubtful cases he may again resort to the frozen section.

A thorough knowledge of the histological appearances of uterine scrapings is of great importance to the surgeon. Where a suspicious appearance of the cervix exists he cuts a piece out, has it examined at once, and if malignancy exists does a complete hysterectomy. If he be not a pathologist and has no expert at hand it may take days or weeks before he can know exactly what he is dealing with, so that valuable time is lost, and the patient suffers prolonged anxiety and added expense. Incidentally, it may be said, the specimen is sometimes lost in the mails.

When malignancy is suspected in the body of the uterus, curettings are obtained, the diagnosis is usually made in a few minutes, and the appropriate procedure carried out. In no other surgical field does a close co-operation between the pathologist and surgeon bring about such brilliant results as in the examination of uterine scrapings.

The surgeon's knowledge of the histological architecture of the pathological condition he is dealing with is often of great practical import. For example, on opening the abdomen he finds a very large multilocular ovarian cyst. On inspection he notes that it conforms in every particular to the common multilocular cystadenoma. He knows that this is benign, and accordingly can with impunity tap it and remove it through a relatively small incision, feeling certain that if a few drops of the fluid should escape into the abdomen it will do no harm.

On the other hand, if the cyst walls are very thin and the cysts few in number he will think of colloid carcinoma and will accordingly make a long incision and remove the tumor

intact, because if some of the cyst's contents escape, secondary implantation may take place on the peritoneum.

Again, when he is dealing with a large multilocular adenocystoma densely adherent to many loops of small bowel in the pelvis and also inseparably adherent to the pelvic wall he will remember that the outer walls of the cyst are composed of laminated connective tissue and that they contain no epithelial elements. Recognizing this important fact he will make his incision very superficially through the outer cyst wall in the pelvic region, and will shell the main tumor out. In this way he will leave a thin shell of connective tissue in the pelvis which is relatively innocuous and will convert a most difficult or impossible operation into a relatively easy one.

The trained surgical pathologist is always on the lookout for new conditions or for links in a process that is as yet not thoroughly understood.

A few weeks ago I did a supravaginal hysterectomy for a multinodular myomatous uterus. Myomata are so common that most of us at times tire of removing them. In the cul-de-sac, however, in this case, I found a lobulated pedunculated nodule, approximately 11 centimeters in diameter, and densely adherent to the sigmoid. As it was shelled out I noticed bluish cysts beneath its surface, and also a rusty area about 1 by 2 centimeters in diameter. In brief, the tumor was a pedunculated, subperitoneal adenomyoma. In over 25 years I have never seen such a specimen, and it demonstrated very clearly how these tumors may in time form immobile and irremovable adenomyomatous growths in the pelvis. Such a tumor means infinitely more to the surgeon than any remuneration he might receive for his services, and he would gladly travel far to obtain so invaluable a specimen.

On November 17, 1920, I operated on a young woman, 24 years of age, for a chronic appendicitis. She had asked me to be sure and examine the right ovary as she thought there was something wrong with it. I drew the ovary out through the gridiron appendix incision and found that it was about half as large again as normal. Seeing a few rather large follicles I punctured them thinking that the increase in size of the organ was due merely to these simple cysts. A fine straight intestinal needle was used. The first cyst yielded a few drops of clear colorless fluid. The second and third contained similar fluid. The ovary, however, being still a little too large, I passed the needle deep into its substance where no cyst was apparent, and immediately there escaped probably a fourth of a drop of an oily fluid. This would doubtless have been overlooked had it not been for the whiteness of the surface of the ovary, and the excellent electric illumination which fell on it at an angle. The oily fluid, although very scant, gave a shimmering effect, which at once told me that we had to deal with a dermoid cyst. An elliptical incision was made over the surface of the ovary and a dermoid cyst, 3.5 centimeters in diameter, was at once encountered. It was shelled out intact and about two-thirds of the ovary left. Had it not been for the systematic puncture, the excellent illumination, and the immediate recognition of the oily fluid as indicative of a dermoid cyst, it would have been overlooked, and the patient would have in all probability been compelled to return for another abdominal operation in from 6 months to a year.

A thorough knowledge of surgical pathology is of inestimable value to the surgeon. Even when alone, he always has the advice of a competent pathologist—if he has had a thorough "binocular" training.

HOW SHALL WE OVERCOME OUR WEAK SPOT—OUR LACK OF PATHOLOGY?

Very easily. Let each surgeon have associated with him a good pathologist. Just so. But in the first place at present there are not enough pathologists to man adequately our existing medical schools. In the second place the trained pathologist is too valuable a man to spend his time around the operating room for half of the day in order to help out the diagnosis in three or four cases; he would lose too much time. In the third place, many small clinics cannot afford to pay a real pathologist.

It is clearly evident then that many years would elapse before all operative clinics

would be able to profit by the services of a pathologist.

But suppose we send our pathological material to a distant laboratory. This has definite drawbacks. In the first place the surgeon cannot command the advice at the operating table which is so often necessary. Again, there is frequently much delay in packing and forwarding the material to the laboratory and not infrequently specimens are lost. Lastly, the fact that the surgeon in some cases must wait days or weeks for the pathological report not only adds greatly to the patient's hospital expenses but what is even more important it has a bad effect on the surgical assistants. When the case is fresh in their minds they grasp it as a definite clinical entity, but when days and weeks pass before the report is given, they may miss the laboratory diagnosis, or if they do learn it, it does not make the same indelible impression upon them.

No well regulated business house would be satisfied with such a cumbersome and slow method and the long period of suspense will often create an unfavorable impression on the patient. This method of procedure, although valuable, is only a make-shift—we must do better.

Scattered throughout the country are a few laboratories where surgical pathology is systematically taught and where graduates in medicine can obtain a thorough knowledge of the surgical pathology of the branch in which they are specializing. Every surgeon looking around for a wide-awake assistant should insist that the applicant have at least one year's training in the surgical pathology of his special branch. The earnest young man will immediately appreciate its value and will at once place himself under the tutelage of a good surgical pathologist for a year at least. At the end of that time he will be invaluable to the surgeon and will in most instances be able to advise the operator during the operation as to the exact condition present, and whenever a frozen section is necessary, a technician can at once make the required section and the assistant render an intelligent opinion then and there. This clearing up of the diagnosis will not only enable the operator to do more intelligent work but will also be of great value to the patient. The assistant will likewise supervise the examination of all pathological material coming from the operating room. This will still further add to his knowledge of surgical pathology.

In 1891 I applied to Dr. Howard A. Kelly asking if I might enter his department as an interne. He said: "Yes, I will take you, but you must first spend several months with Dr. Welch and Dr. Councilman studying in pathology and bacteriology."

In due time the assistant becomes a full-fledged surgeon himself and having realized to the full the value of a fundamental knowledge of surgical pathology will insist that all those coming to him for surgical training shall be well grounded in the pathology of surgical diseases. In this manner there is no reason why the surgeons of the next decade should not all have a comprehensive knowledge of their own particular branch.

THE TRAINING OF THE ASSISTANTS IN THE GYNECOLOGICAL DEPARTMENT OF THE JOHNS HOPKINS HOSPITAL

Each year four of the graduating class are assigned to the gynecological department. During the year these men have charge of the patients in the private and public wards, take all the histories, assist at operations in the morning and work in the gynecological and cystoscopic dispensaries in the afternoon.

At the end of the year, after a conference with the house staff and the visiting staff one of the four men is picked out for promotion. The other three obtain hospital appointments elsewhere or enter private practice.

The man who has been selected now drops out of the gynecological department for a year and becomes an assistant of Dr. William G. MacCallum, professor of pathology. During his interne year this man has obtained a very good idea of the difficulties encountered in the various abdominal and pelvic operations and consequently is better able to appreciate the opportunities afforded him in the pathological department. He is, however, no novice in this laboratory because in his undergraduate days he received his instruction here.

He is now permitted to make numerous autopsies and gains a clear idea of gross patho-

logical lesions. While making the autopsies he has the opportunity of dissecting out the ureters and of learning the relations of the pelvic structures. He is continually dissecting out the bile-ducts to see if they are patent and has ample opportunity to observe carefully the lymphatic ducts. He also gains a lasting knowledge of the relations of the abdominal organs and of the blood supply. After a year's opportunity in such work he can never again get lost in the abdomen (How many of us would gladly embrace such a year's training even now!). In addition to all this he gains an insight into the lesions in all parts of the body, and has the opportunity of studing the histological picture of the various lesions noted at autopsy. He likewise has the privilege of attending again the undergraduate classes in pathology and of participating in the invaluable pathological conferences that are held each week.

I cannot let this opportunity pass without publicly thanking Dr. MacCallum for the rare privilege he has accorded the junior men of the gynecological department. I personally am also under many obligations to him because as a result of the extra year's training in general pathology the incoming man will have a much wider grasp of gynecological pathology.

At the end of a year our assistant in pathology returns to the gynecologial department, he examines and describes all material coming from the gynecological operating room, supervises the cutting and staining of sections, and gives a careful and detailed description of the histological findings. Ample time is afforded him to work on special gynecological problems and he is within easy distance of that mine of information, the Surgeon General's Library, where practically every book and every periodical that is worth reading can be obtained. He also has an opportunity to see all the interesting cases treated in the department.

During the following year he is first assistant, assists at operations, has general supervision of the wards, and when the resident is away is in charge.

During his final or fifth year he is the resident gynecologist and has full charge of the department and in addition to assisting the visiting surgeons performs many major and minor operations himself.

The finished product is:

1. A man who has a good knowledge of general pathology;
2. One who has an intensive knowledge of gynecological pathology and is the author of several papers on this subject;
3. A man with a comprehensive knowledge of gynecological and abdominal diseases;
4. An expert gynecological and abdominal surgeon;
5. One who has formed the habit of looking at his cases from every standpoint.

A man with such a training will not only do justice to his patients but should also prove an admirable teacher. He is bound to add to the sum total of our knowledge of gynecology and abdominal surgery. Few men who have become real investigators will ever be satisfied to relinquish this fascinating field during their active period of surgical life.

In years past many general practitioners gradually drifted into surgery. This is rarely possible today, as an adequate apprenticeship now requires several years of intensive study.

Those of us who graduated 30 years ago could not be expected to know surgical pathology. The same applies to the man who has been in practice 20 years, but the man who has entered the surgical field during the last decade has not the same excuse. If he has sought diligently he could have found some excellent teachers of surgical pathology. An occasional one has embraced the opportunity, but "where are the nine?"

I have always been grateful to the late John Caven who came back from von Recklinghausen's laboratory in 1889 bubbling over with enthusiasm. It was he who pointed out to me in no uncertain terms the value of pathology. Later it was my good fortune to study under that indomitable teacher Johannes Orth, the successor of Virchow. But to William H. Welch I am under an everlasting debt. For over 20 years, whenever in doubt, I had the rare opportunity of his advice and counsel. He was never too busy to look at my specimens and to spend hours if necessary

in making their meaning clear to me; and when something new was discovered he was really more pleased than if he had found it out himself. No other man in America has ever done as much to foster the spirit of laboratory investigation or afforded more encouragement to his pupils than Dr. Welch.

If one wishes to build a small cottage the simplest kind of foundation is sufficient. If on the other hand, he desires to erect a mighty structure deep foundations are essential. Pathology is the foundation of a surgical career.

You and I have learned much from the publications of other surgeons. Are we going to be sponges, merely assimilating the labors of others, or are we going to do our share in adding to the sum total of human knowledge?

The publishing of surgical papers without including the necessary pathological reports is like leaving out several chapters of an interesting novel. Those of you who have neglected the study of pathology should take it up at once. You will then learn the joy it brings. Often you will hardly be able to wait to see whether your diagnosis is correct or not. Day after day will unfold a new panorama and now and again you will have the delight of finding something brand new—something that has never been described before.

We are justly proud of the great strides American surgery has made. The technique in most of the surgical clinics is of a high order and the operative results excellent. Our College of Surgeons represents American Surgery. If America is to lead the world in surgery in the near future every member of this our surgical family must be thoroughly trained in the one thing still needful—surgical pathology.

BRAIN ABSCESS FOLLOWING FRONTAL SINUSITIS

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A CASE of brain abscess following frontal sinusitis, which is one of a series previously reported from the Mayo Clinic (1), is selected for this report, because it illustrates excellently the classical symptoms of brain abscess and some of the problems met with in the surgical treatment of the disease.

Case 112525. The patient, a girl, aged 11, was examined in the clinic, November 6, 1919. Her tonsils and adenoids had been removed 7 years before; otherwise she had been in normal health. October 19, 1919, she was taken on a 150-mile automobile ride, and the next day she developed a coryza, which lasted 6 days, and was followed by headache, fever, and vertigo. Ten days after the onset a swelling was noticed below the right eyelid; this extended to the side of the face and forehead. October 28 the patient had a temperature of 102°. The swelling and pain persisted and November 5 a physician made an incision over the right eyebrow, evacuating pus.

Examination at the clinic revealed a large, smooth, fluctuating swelling over the forehead. Extreme cloudiness of the right frontal sinus, with some cloudiness of the left antrum, was shown by the roentgenogram. The pupils were equal in size and normal in reaction, with slight hyperæmia of the discs. No pus was found in the nose. The frontal sinuses could not be probed. The neurological examination was practically negative except for a slight ptosis of both eyelids. November 8, the patient suddenly went into general convulsions, which lasted 3 hours. Following this she was unable to move the left arm and leg, and the left side of the face. The right side was normal. Jacksonian convulsions of the left leg supervened on the same day; ankle clonus was marked on the left, and slight on the right. The Kernig sign was positive; the neck was rigid. In the afternoon of the same day there was a marked Babinski reflex on the left with the left arm and leg rigid. The patient was stuporous for the next 36 hours, with persistent left spastic hemiparesis. November 7, 10, and 17, the leucocyte count was 23,600, 25,800, and 12,000 respectively. Left paresis persisted and the patient's temperature varied from normal to 100° until November 23, when it returned to normal and remained so until the operation November 27, when a fluctuating mass in the frontal area was drained. The patient convalesced favorably except for a slight fever daily, with persistent weakness of the left side, until a second operation December 19. At this operation sequestra were removed from the right frontal bone. The dura

was exposed at one point but not perforated. The wound was drained with a gauze wick. The patient improved rapidly and in a few days was allowed to go home under observation.

January 8, the patient had several left Jacksonian convulsions. She was not unconscious during the attacks. The third operation was performed January 19, 1920. Sequestra were removed from the frontal bone and the dura was exposed over the right frontal area about 1.5 inches above the orbit. Again convalescence was satisfactory. The œdema of the eyelid disappeared, and the paresis improved, so that there was only a slight left-sided weakness. The patient went home, and from January 24 until March 1 she felt quite well, but still had slight left-sided weakness. She was able to roller skate and play, but had days of malaise, with loss of appetite. About March 1 she began to grow worse; headache and bulging of the area of the skull defect appeared, with daily fever and pain over the right frontal area.

March 19, the patient returned to the clinic. Examination at this time revealed choked discs of four diopters in both eyes and a slight weakness of the left side of the face, left arm, and left leg, with some exaggeration of the deep reflexes on the left. March 27, under ether, through the site in the frontal region where bone had been removed at the previous operation, the dura was exposed. On the insertion of a trocar and cannula, through the area which had become walled off by adhesions, into the right frontal lobe, an abscess was encountered about 2 inches below the surface under the outer part of this lobe. The walls of the abscess were firm; it contained about 3 ounces of pus. The abscess cavity was washed out with saline solution by inserting into it a small catheter attached to a syringe. Two rubber tubes made by cutting a No. 16 French male catheter were inserted into the cavity for drainage.

The patient made a rapid recovery and was able to leave the hospital on the sixth day. She gained in weight and strength rapidly. The paresis disappeared quickly, and the choked discs constantly diminished. One tube drain was removed 3 weeks after operation, and the second tube was gradually shortened. May 2, after the second tube had been so shortened that it just reached the outer edge of the abscess cavity, the dressings slipped during the night and the tube fell out. During the following 24 hours the symptoms returned, right frontal headache, malaise with clouding of the sensorium, slight fever, and increasing left-sided weakness. A curved forceps was very gently passed down the drainage tract and a catheter re-inserted. A quantity of pus was drained and the symptoms cleared up within 24 hours after the accident. May 12 hardly one diopter swelling in each eye remained. The second tube was removed May 20. The wound healed in a short time and the patient has been entirely well since.

Brain abscess is likely to develop in conjunction with osteomyelitis of the skull, and thorough drainage is advisable during the quiescent stage. In the case reported, during a period of 4½ months the patient presented symptoms of intracranial complications, but the signs of localized abscess did not seem sufficient to justify exploratory puncture of the brain until the appearance of the choked discs and the increasing left-sided paralysis, when a diagnosis of abscess was made and exploration advised.

The postoperative care, and especially the drainage, in deep-seated abscess of the brain must be looked after carefully. It is important that the drainage tubes be left in place instead of being withdrawn and replaced frequently. This point has been emphasized by Elsberg. The danger of too early permanent removal of the tubes is well illustrated by the accident in this case. Drainage tubes may be removed safely when the purulent drainage disappears and only a slight ropy mucilaginous material exudes. This stage may be reached in from 1 week to 3 months after the operation.

REFERENCES

1. Adson, A. W. The surgical treatment of brain abscess. J. Am. M. Ass., 1920, lxxiv, 532-536.
2. Elsberg, C. A. Abscess of the frontal lobe following orbital cellulitis. Ann. Surg., 1917, lxvi, 508.

DEPARTMENT OF TECHNIQUE

NITROUS-OXIDE-OXYGEN ANALGESIA IN MAJOR OPERATIONS

A Further Advance in Anociation

By G. W. CRILE, M.D., F.A.C.S., Cleveland

HERETOFORE, in considering the advantages of local anæsthesia, alone, as compared with general anæsthesia, alone, the surgeon has been placed in the difficult position of choosing between two evils: he must either operate with his patient under complete surgical anæsthesia, knowing that in grave risks the interference of the anæsthetic with the internal respiration alone, disregarding all other unfavorable factors, would often cause death, not on the table, but later. Or, if the surgeon wished to escape this horn of the dilemma, he must discard general anæsthesia altogether and adopt local anæsthesia alone as the method of his choice. In this case, many of the patients would go through the operation without pain, a large number with pain, and all of them with great mental anxiety and distress, the harmful effect of which in grave risks might cause death.

Moreover, bad risk patients cannot endure even the mild degree of suboxidation due to surgical nitrous-oxide anæsthesia. The types of cases of which this is particularly true are starved and toxic cases—cases of obstruction of the pylorus, of cancer of the large intestine and of diseases of the gall-bladder and common duct. This danger is especially manifest in cases of severe exophthalmic goiter. In such cases, without question, even the most guarded nitrous-oxide-oxygen anæsthesia is harmful to the extent to which it interferes with the internal respiration, especially the internal respiration of the liver, the myocardium and the brain.

Now if a bad risk patient cannot safely be carried through an operation under inhalation anæsthesia, and if, on the other hand, he cannot safely be operated upon under local anæsthesia alone, then what course remains for the surgeon?

In the effort to solve this problem, two schools have developed: one consisting of those who believe in local anæsthesia exclusively in bad risks, and for most operations; the other, and larger school, comprising those who believe in general anæsthesia for all patients, and consequently reject those cases in which, according to the experience of the surgeon, the margin of safety appears to be too narrow for safe operation under a general anæsthetic.

Believing that neither of these schools were attaining the most desirable results from the standpoint of the patient's comfort and safety, we sought in our clinic to adopt a course which combines the advantages and avoids the disadvantages of each; that is, to employ analgesia combined with local anæsthesia.

Since 1880, when Klikowitsch successfully employed nitrous-oxide-oxygen to lessen the pains of labor, this form of analgesia has been familiar to obstetricians; and during later years it has been extensively used by dentists. Dr. Walter Evans and others have advocated the use of nitrous-oxide-oxygen analgesia in minor operations, especially in operations on the nose and throat and in certain major operations.

In our clinic we first employed nitrous-oxide-oxygen analgesia for bad risk cases of exophthalmic goiter and have gradually extended its use to bad risk cases of all kinds until now it is employed in approximately 90 per cent of all our cases.

It happens to be the remarkable property of that degree of nitrous-oxide-oxygen anæsthesia which is known as analgesia that the patient is freed to a considerable extent from the sensation of pain, yet retains his intellectual control, and at the same time is entirely freed from his emotions. One could undoubtedly say to a patient under analgesia: "You will die in a few moments," and this would mean to him merely the statement of a fact in which he was not particularly interested since by analgesia he has been rendered incapable not only of expressing, but even of feeling an emotion. In brief, analgesia completely separates a patient from his emotions, affords him great relief from the sensation of pain, and at the same time allows his brain to function sufficiently to aid him in "carrying on." Of paramount importance, however, is the fact that in analgesia the internal respiration is not in the least impaired.

The state of analgesia may be continued for the largest operation, even with very sick patients without any bad results. Because of these observations we have been collaborating with Miss Hodgins and other members of the anæsthetic staff in an endeavor to perfect the technique of the administration of analgesia plus local anæsthesia as the greatest aid to surgery of which we can at the present time conceive, since by means of it the patient undergoes a pleasant experience and a shockless operation, and above all, because he passes through the operation not only with his internal respiration unimpaired, but with all his factors of safety undiminished.

The chief anæsthetist of Lakeside Hospital, Miss Agatha Hodgins, offers the following practical notes:

It is one thing to have decided upon analgesia as the most satisfactory form of anæsthetic; it is quite another to administer analgesia properly. To accomplish this requires great versatility, a quick and ready understanding, and a sympathetic attitude toward the patient. The ideal anæsthetist will be able not only to give the patient confidence in himself, but confidence in the anæsthetist and the operator as well. Skill in handling psychical and personal factors are as necessary to the anæsthetist as skill in gauging the correct amount of gas and oxygen which will assure pure analgesia without intoxication. It takes at least 6 months' training under an expert anæsthetist who can give good analgesia before the novice will have developed all her own resources.

The anæsthetist must be carefully trained to recognize promptly the approach of the different zones of anæsthesia. In true analgesia, the patient is in a state of mental indifference which is manifested by a placid expression. It is possible to maintain mental contact with the patient, and to get responses from him. It must be borne in mind, however, that although the patient still has control of his mental faculties, nevertheless the brain processes are considerably retarded, so that response will be retarded accordingly. In true analgesia the voice is thickened. Therefore, when there is a thickened voice and a slow response, it is evident that the dosage of gas should not be increased, for the patient is on the border-line between analgesia and anæsthesia, and will readily pass into the state of anæsthesia.

Perhaps the best index to the comfort of the patient and the degree of analgesia is the expression of the eyes, which should be closely watched by the anæsthetist. If the expression of the eyes is quiet and undisturbed, and the eye movements are rather slow, the anæsthetist may be assured that analgesia is satisfactorily established. A more rapid movement of the eyes combined with a worried expression may indicate pain, and hence the necessity of slightly increasing the dosage of gas, possibly to the momentary establishment of anæsthesia. On the other hand, these indications may be a warning that the patient is coming out of the analgesia.

The rate of respiration is of the utmost importance. An increased rate almost uniformly indicates pain. An attempt to move may or may not indicate pain, since in analgesia the patient to some extent retains control of his mental powers, and the brain may be aiding the body by shifting it to a more comfortable position. For example, if there is traction, the patient may be adapting his muscles to the traction, thus diminishing the pressure. When there is pressure, the patient usually holds his breath, in which case oxygen alone should be administered, and the nitrous oxide stopped for a moment. If pain is clearly indicated, the analgesia should be increased to anæsthesia, but—and this is very important—only temporarily, until the acute pain stage is passed. The patient should be brought back as quickly as possible to mild analgesia before he has had the chance to pass into the second stage of anæsthesia.

In the course of an operation it sometimes becomes necessary to change the position of the patient. In such a case, the necessity for the change should always be explained to the patient in order that his retarded mentality may not be disturbed by it. It is an important part of the anæsthetist's task, in fact, to make the unusual seem usual. The following illustration will perhaps elucidate this point. In removing a large goiter, traction and pressure are almost unavoidable. At this point, the patient's eyes usually indicate pain and bewilderment; but if the anæsthetist remarks: "You put on a new collar this morning. It is a little tight," the patient will at once seem satisfied and the expression of the eyes will become comparatively calm.

The advisability of talking to the patient during operation is a debatable question. Here the personality of the anæsthetist and his ability to form a correct estimate of the personality and the needs of the patient, and hence to form a sympathetic mental contact, will count for much. The right amount of conversation will be an aid to the patient; too much will disturb him, for it must be remembered that the power of response is so retarded that it is difficult for him to answer; and moreover, that in operations on the neck, talking on the part of the patient is interfered with. Though this is not true in all cases, it is frequently advisable for the operator to speak to the patient when he comes in, particularly if the patient has expressed any doubt as to whether or not the surgeon of his preference is to perform the operation.

Under analgesia, the sense of hearing seems to become altered. The patient often speaks much louder than is necessary but he is also extremely annoyed by whispering. This fact should constantly be borne in mind by all those attending the operation. Any remark that is made should be in a normal speaking voice, for whispering invariably leads the patient to think that something is going wrong.

As to the appreciation of time and space under analgesia, the sense of each is exaggerated. This is particularly noticeable when taking a patient under analgesia into an elevator, for he seems to feel the drop and rise more than is normal; and therefore, when it is necessary to take such a patient in the elevator, the anæsthetist should explain what is happening as simply as possible. All explanations should be simple, should relate whatever is happening to everyday occurrences which the patient knows will not harm him.

The operator should also co-operate with the anæsthetist in guarding the patient against pain by warning the anæsthetist that a painful procedure is about to take place. This is particularly true in dislocating tumors, and whenever unavoidable traction is produced. During this period the patient should be momentarily advanced to the stage of anæsthesia.

It will be evident from the above discussion that an anæsthetist who can satisfactorily administer analgesia must possess true sympathy, coupled with that type of intellect which can successfully conduct a debate, an intellect which at the outset forms a correct estimate of the

problem in hand, the disease plus the personality and intellect of the patient. It is essential also that as the operation progresses the anæsthetist accurately gauge from moment to moment the sensitiveness and control, or lack of control, on the part of the patient. These are, indeed, rare qualities, but an anæsthetist who possesses them has an opportunity for immeasurable service to surgery.

Our record of 1518 adminstrations of analgesia includes the following major cases:

1107 thyroid operations including 360 thyroidectomies and 389 ligations.

149 abdominal operations, including 16 upon the large intestine, 26 upon the gall-bladder, 22 upon the stomach, 8 exploratory laparotomies.

The mortality in this series was 0.59 per cent. These figures include an unbroken series of 443 thyroidectomies and ligations without a death.

REFERENCES

McMechan, F. H. The nasal administration of nitrous-oxide-oxygen anæsthesia and analgesia. American Year Book of Anæsthesia and Analgesia, 1915, 251-273.

Walter, W. Analgesia and short anæsthesia in daily practice. Am. J. Surg. (anæsthesia supp.), 1919, xxx, 20-23.

Evans, John H. Nitrous oxide oxygen analgesia in major and minor surgery. Am. J. Surg. (anæsthesia supp.), 1916, xxx, 52-56.

Large, S. H. The use of nitrous oxide and oxygen analgesia in operations on the ear, nose, and throat. Cleveland M. J. 1917, xvi, 725.

TUBERCULOUS ULCER OF THE ANTERIOR VAGINAL WALL WITH RESECTION OF ULCER[1]

By ERNEST K. CULLEN, M.B., F.A.C.S., Detroit, Michigan
From the Department of Gynecology, Harper Hospital

TUBERCULOUS ulceration of the vagina is only occasionally observed. It may be the sequel to extensive peritoneal and pelvic tuberculosis. Rarely, however, is the vagina the only pelvic structure involved, and to this group alone shall we refer. Those cases which have been reported show in nearly every instance an associated or pre-existing pulmonary tuberculosis.

Namias (1) in 1861 reported a diffuse tuberculous ulceration of the vagina and bilateral pulmonary tuberculosis, in a prostitute.

Klob (2) in 1864 reported a case showing at autopsy, tuberculosis of the lungs, tuberculous ulceration of the intestine, tuberculosis of the liver and tuberculous ulceration of the vagina.

Deschamps' (3) patient, 25 years old, showed tuberculous ulceration of the vulva and vagina, tuberculous ulcer of the hand and bilateral pulmonary tuberculosis.

Pitt (4) in 1887 reported an interesting case of a small ulcer of the vagina and I shall present his report verbatim.

There is a single irregular ulcer one-sixth inch across, with loss of mucous membrane, one-fortieth of an inch deep, situated three-fourths of an inch from the os uteri on the anterior wall of the vagina. The floor is irregular, the margin at one spot is undermined. When fresh the margins were extremely congested and swollen, but there was no infiltration and no signs of adjacent tubercles. The ulcer was fairly recent and not healing.

Ulcers in the upper part of the vagina, excluding malignant and traumatic, are uncommon. None are recorded in the transactions of this society.

The patient in whom this ulcer was found had been in the hospital in bed for 4 months previous to her death, suffering from phthisis. Postmortem. Numerous tubercular ulcers were found in the intestine and larynx.

Zweigbaum (5) in 1888 reported a case of old pulmonary tuberculosis with associated tuberculous ulceration of the vulva, vagina, and portio vaginalis.

Havas (6) in 1897 reported a case of tuberculous ulcer of the introitus vaginæ.

I present the following case as one of special interest from a clinical, pathological, and operative standpoint.

L. S., age 37, married, admitted to Harper Hospital, March 22, 1920. For four years the patient has complained of recurrent attacks of dull aching pain in the lower abdomen, and during the past 6 months has complained of irregular vaginal bleeding. For the past 6 weeks this bleeding has been slight in amount but constant. She has had also increased frequency of urination during the day time and occasional smarting sensation in the vagina. The patient, her husband, and a son, 8 years of age, have been in the tuberculosis department of the Herman Kiefer Hospital for 2 years. The patient and her husband are suffering from pulmonary tuberculosis, and the son from tuberculosis of the right hip-joint. The husband on careful examination has shown no evidence of urogenital tuberculosis. Blood Wassermann tests were made on both the patient and her husband, a positive reaction being reported in each instance. From their

[1] Read before the Southern Surgical Association, Hot Springs, Virginia, December, 1920.

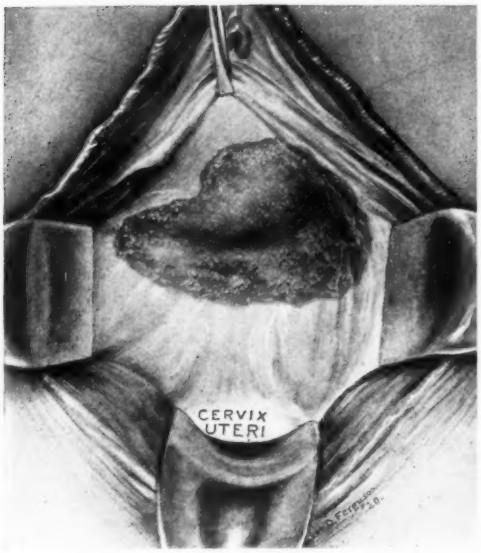


Fig. 1. Tuberculous ulcer of anterior vaginal wall (natural size). The ulcer measures approximately 6 by 4 centimeter. The margins which are firm are elevated about 2 millimeters above the base. The latter presents the typical applejelly appearance of a tuberculous ulcer and on manipulation fine bleeding points are visible.

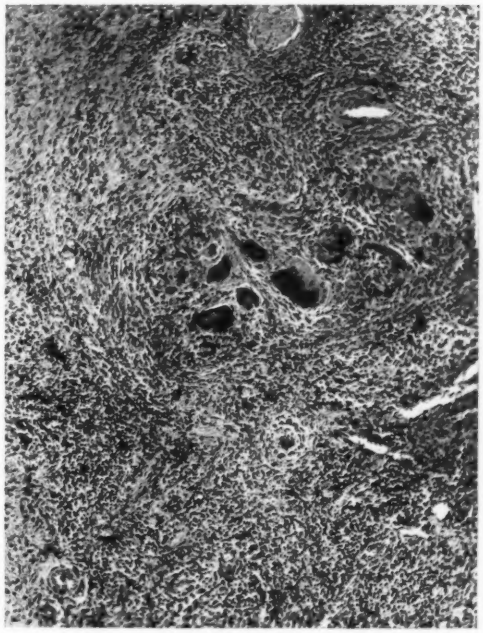


Fig. 2. (Photomicrograph approximately 300 diameters.) This section taken from the margin of the ulcer presents the typical picture of active tuberculosis. The giant cells in this section are especially numerous.

histories, however, we have been unable to obtain any clinical evidence of lues. Relying solely upon the positive Wassermann reaction both had been given salvarsan and mercury. The patient had typhoid fever at 16 and pneumonia at 25. Her menstrual history has been perfectly normal. She was operated on 16 years ago for a right ruptured extra-uterine pregnancy. She gave birth to a full-term child 13 years ago, the child living, however, but 3 days. She had a second child born 8 years ago. Both labors were normal. A therapeutic abortion for a 3 months' pregnancy was performed in June, 1919.

General physical examination of the patient on March 23, 1920, shows moderately active bilateral pulmonary tuberculosis.

Abdominal examination is negative, except for slight pain on deep palpation over the left lower quadrant.

Vaginal examination. The outlet is marital with some relaxation. There is a scant bloody vaginal discharge. The urethral orifice is normal. On introduction of the examining finger into the vagina it immediately comes in contact with a roughened area on the anterior wall. Manipulation of this causes some bleeding, but the patient suffers very little discomfort. The cervix is normal in size, points backward, and is perfectly smooth. The fundus is normal in size, in anteposition, but movement is restricted. The appendages on the right side are free. Occupying the left fornix is a small cystic mass approximately 5 centimeters in diameter, which is movable but tender on manipulation.

On examination of the vagina with the speculum an irregular punched-out ulcerated area (Fig. 1) measuring approximately 6 by 4 centimeters is found on the anterior vaginal wall beneath the base of the bladder and extending a slight distance downward along the urethra. The margins of the ulcer are hard and elevated about 2 millimeters above the base. The latter presents the typical apple jelly appearance with fine bleeding points on manipulation

Smears taken from the ulcer and examined with the dark field illumination were negative for spirochætæ. Smears were also negative for tubercle bacilli.

The clinical laboratory findings are as follows:

Urine examination (catheterized specimen) shows specific gravity 1,012; acid; pale color; cloudy; no sugar; no indoxyl; no bile; slightest trace of albumin. The centrifugated sediment which is slight contains a few squamous epithelial cells, numerous pus cells, but no casts or blood. Examination for tubercle bacilli was negative.

Blood examination showed hæmoglobin 70 per cent (Talquist); red cells 3,700,000; white cells 14,000.

Differential white cell count: Polymorphonuclear cells, 74 per cent; small mononu clear cells 6 per cent; large mononuclear cells, 17 per cent; transitional cells, 3 per cent.

A blood Wassermann showed a 4+ reaction. (There were no clinical manifestations of lues.)

Roentgenological report by Dr. William A. Evans. Plate of the chest in the posterior position shows no evidence of lower lobe pathology nor any evidence of pleuritis. There is an increased deposit at the hilus on both sides and accentuation of the linear markings. There is evidence of a bilateral, parenchymal infiltration, this being seen more especially opposite the first and second interspaces on the right side, and opposite the first interspace on the left side. There is an area of increased density opposite the middle

portion of the right hilus and also opposite the fifth interspace on the right side. The appearance is that of a well-resisted parenchymal tuberculosis.

Cystoscopic examination shows the bladder mucosa normal in appearance except for some reddening over the trigonum. Both ureteral orifices are normal. There is no evidence of tuberculosis.

April 8, 1920. Under gas anæsthesia two small wedge-shaped pieces of tissue were removed from the margins of the ulcer. These, on microscopical examination, presented the typical picture of active tuberculosis (Fig. 2).

Before attempting excision of the ulcer we wished to ascertain what curative results might be obtained by use of the roentgen-ray or radium. Before so doing, however, we decided to relieve the patient's abdominal symptoms.

Abdominal operation, April 14, 1920, median incision. Examination of the pelvic structures shows the presence of a left cystic ovary 6 centimeters in diameter and an adherent tube. The right tube is missing. The right ovary and uterus are normal. Examination of the pelvic structures shows no evidence of tuberculosis. Scattered over the head of the cæcum, however, are a few discrete and confluent tubercles. The appendix shows only slight chronic thickening. Examination of the other abdominal viscera shows no gross evidence of tuberculosis. The appendix and left tube and ovary were removed. On microscopical examination the tube shows chronic salpingitis, the ovary a corpus luteum cyst, and the appendix a chronic catarrhal inflammatory process. No tuberculosis is evident at any point.

May 11, 1920. Dr. J. E. King subjected the ulcer to a maximum dose of roentgen-ray.

May 29, 1920, Dr. J. E. King inserted 50 milligrams of radium into the vagina for a period of 5 hours. The patient was discharged from the hospital on June 1, 1920.

July 15, 1920, a second similar-sized dose of radium was again given.

September 12, 1920, the patient was again admitted to the hospital.

The roentgen-ray and radium had shown no appreciable effect on the ulcer and we decided to attempt excision.

Operation September 7, 1920. Dilatation and curettage, excision of ulcer. Dilatation and curettage were performed, but only a small amount of curettings were obtained.

In order to facilitate removal of the ulcer and also to minimize damage to the bladder, it was deemed advisable to make a vertical incision directly through the ulcer. The line of demarcation between the base of the ulcer and the underlying fascia was more definite than we had anticipated. The line of cleavage thus obtained made simple the removal of both portions of the ulcer, leaving a perfectly clean-cut wound. The margins were then approximated with a continuous locking suture of No. 2 chromic catgut. Three stay sutures of the same material were employed. Catheterization showed the bladder uninjured. Following operation catheterization was ordered every 8 hours until the seventh day to avoid any strain on the vaginal wall. Convalescence was slow but uneventful. There was some breaking down of the wound at the left upper angle but this soon healed by granulation.

Histological report. Examination of the uterine scrapings shows a perfectly normal endometrium. Further sections from the ulcer show the same picture of tuberculosis as previously reported (Fig. 2).

December 11, 1920. The wound has healed perfectly and the patient is free from any discomfort. The bladder condition is rapidly clearing up.

February 1, 1921. This patient returned today for examination. I found a recurrence of the tuberculous process on the anterior and left vaginal walls with extension outward toward the left labium minor, in close proximity to the external meatus. The patient complains of burning pain in this area on urination.

June 1, 1921. Some improvement has resulted from frequent applications of the Kromayer light.

The salient features of this case are the following:

1. The tuberculosis seemed to be limited to the lungs, the head of the cæcum and the anterior wall of the vagina.

2. The anterior vaginal wall was the only pelvic structure involved in the tuberculous process.

3. There was no evidence of urogenital tuberculosis in the husband.

4. The involvement of the vaginal wall appears to have been hæmatogeneous in origin.

5. It was possible to resect the ulcer with subsequent healing of the wound.

In conclusion, I wish to express to my resident, Dr. O. C. Foster, my appreciation for much of the clinical data obtained and to Dr. C. I. Owen, of the pathological laboratory, for assistance in a study of the literature.

BIBLIOGRAPHY

1. Namias, G. Sulla tubercolosi dell'utero e degli organi ad esso attinenti. Reprint from Mem. dell' I. R. istituto, v. 7.
2. Klob, J. M. Pathologische Anatomie der weiblichen Sexualorgane. Wien: 1864, p. 432.
3. Deschamps, E. Archiv. de toxocol., 1885, xii, 19, 120.
4. Pitt, S. N. Tr. Path. Soc., Lond., 1887, xxxviii, 249.
5. Zweigbaum, M. Berl. klin. Wchnschr., 1888, xxv, 443.
6. Havas, A. Orvosi hetil., Budapest, 1897, xli, 497; Zentralbl. f. d. Krankh. d. Harn- u. Sex.-Org., Leipzig, 1897, viii, 661.

A METHOD OF CRANIOPLASTY

Using as a Graft One-half the Thickness of the Bony Part of a Rib

By MAX BALLIN, M.D., F.A.C.S., Detroit, Michigan

A BONY defect in the skull shows no tendency toward repair. Though the periosteum, the cancellous diploe between the two tables and the dura all have osteogenetic powers, the periosteum soon grows down over the edge of the defect and becomes adherent to the dura. This cicatricial union prevents or limits any callus production. The only exception is when the wound has been left open for a considerable length of time. In some of these cases the skull defect has been noted "as becoming smaller," presumably because the granulations prevented the periosteum-dura cicatrix and the accompanying infection was a stimulus to osteogenesis.

The exposed dura, meninges, or brain substance soon become adherent to the overlying skin and this is followed by a variety of symptoms. These, known only vaguely before the war, have been seen so constantly and frequently during the last few years that they have been grouped by some[1] into a "trephine syndrome."

They are: (a) headaches, constant and severe, often associated with melancholia or perversion of the disposition, emotional disturbances, insomnia, etc. They may be made worse by weather changes, sunlight, heat, exertion, etc. (b) Unpleasant sensations of vertigo or nausea, especially when suddenly changing position, stooping over, turning the head quickly, etc. (c) Inability to tolerate external vibrations, as a moving train or shaking automobile; sometimes there is dizziness on walking or inability to stand the flicker of a movie film. (d) A sense of insecurity, due to the constant dread of further injury, often preys on the patient's mind. "The existence of a loss of substance preoccupies the patient so that he lives in a continued state of inquietude and brooding."[2] Janssen[3] in a series of 323 collected trephined cases, found some or all of these symptoms present in 98. Warstat[4] in 56 observed cases found only 4 which showed no changes of this nature.

Epilepsy is present in 10 per cent of trephined wounds (Janssen[5]). Holz[6], in 120 brain wounds, found 11 cases of epilepsy: 9 were in wounds of the arm-leg motor areas, 2 were extensive occipital wounds. It generally develops 2 to 3 months after the injury.

Cranioplasty relieves most of these symptoms, and the relief is generally immediate. Some have advised waiting 6 to 8 months before repairing the defect, believing that there is danger of latent infection before this. There are advantages in doing the cranioplasty early. The scar process is interrupted so many months sooner and epilepsy is prevented. Gilmour, Hotz, and others

[1] Nesselrode. Surg. Clin., Chicago, 1918, iii, 789.

[2] Montpelier méd., 1918, 55.

[3] Quoted in editorial. Ann. Surg., 1919, lxix, 61.

[4] Deutsch. med. Wchnschr., 1918, p. 112.

[5] loc. cit.

[6] Beitr. z. klin. Chir., 1915, xcviii, 592.

Fig. 1. Rib graft in place in the skull 7 months after transplantation.

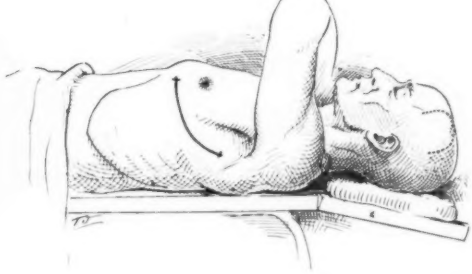


Fig. 2. Incision in midaxillary space to expose sixth and seventh ribs. Also note outline of skull defect.

Fig. 3.

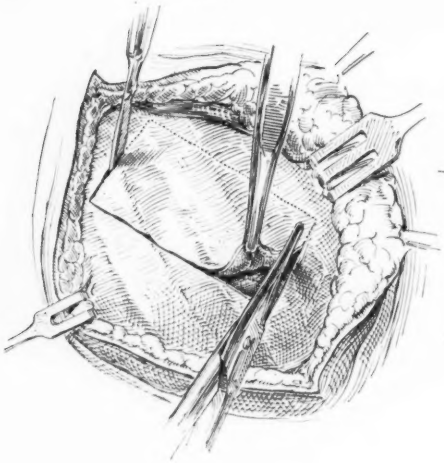
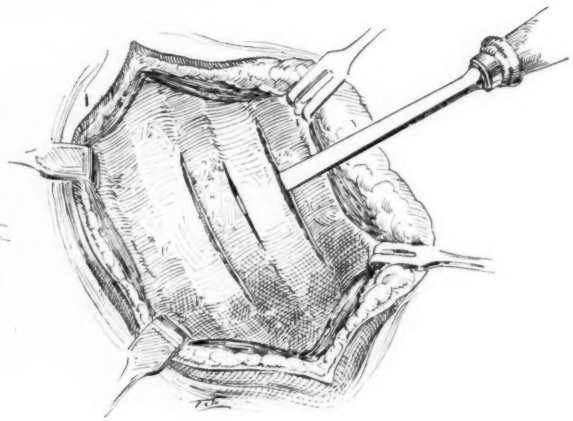


Fig. 4.



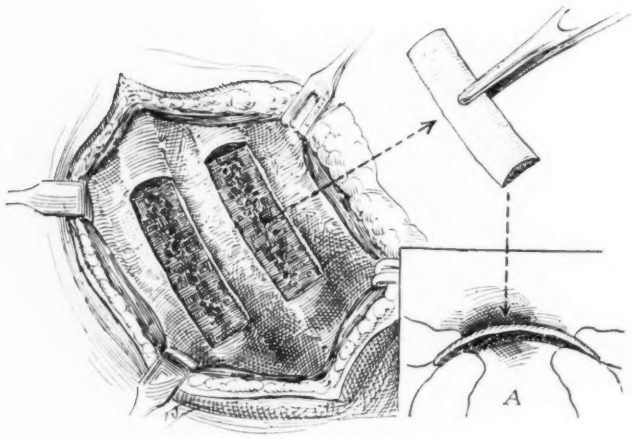


Fig. 5.

Fig. 3. Quadrilateral piece of fascia excised from pectoralis fascia somewhat larger than skull defect.

Fig. 4. Rib exposed by pushing the muscles aside; periosteum incised along upper margin of rib and the outer half of rib chiseled off with a narrow, thin-bladed chisel, splitting the rib gradually.

Fig. 5. Such grafts may be taken from two or three neighboring ribs. Upper insert shows graft. Lower insert shows flexibility of graft.

advocate the secondary closure as soon as the wound has healed, *i.e.*, within the first month after injury.[1]

METHODS

Before the general application of the free autogenous transplant various foreign substances were used to bridge the defect. These included plates of gold, silver, ivory, horn, mica, rubber, cork, celluloid, and paraffin. They were all open to the same objection as all heterogeneous grafts, i.e., delayed suppuration, frequently necessitating their removal long afterward. These methods now have merely an historical interest.

Next was the Koenig-Mueller skin-osteo-periosteal flap. This method consisted in the exchange of two pediculated flaps. One taken from over the defect contained only the scalp covering the defect. From the neighborhood a second flap was formed with a pedicle in the opposite direction to that of the first flap. This second flap contained scalp, pericranium, and outer table chiselled off carefully from the diploe. These two flaps were exchanged, so that the bone-containing flap

[1] Canad. M. Ass. J., 1919, ix, 922.

Fig. 6.

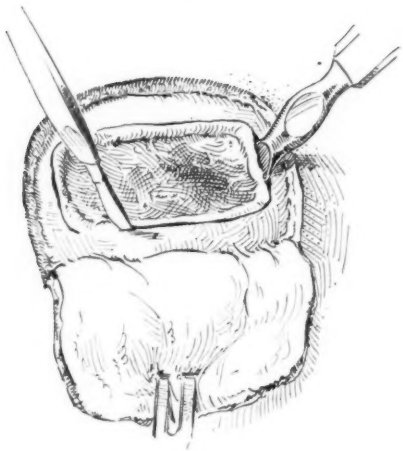
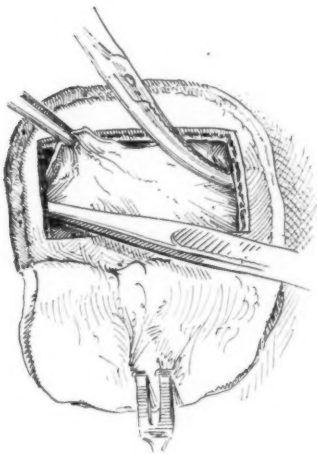


Fig. 7.



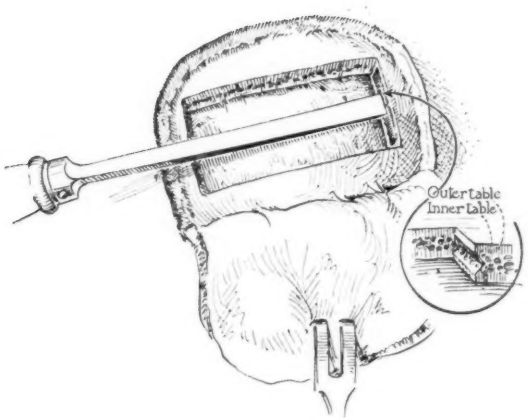


Fig. 8.

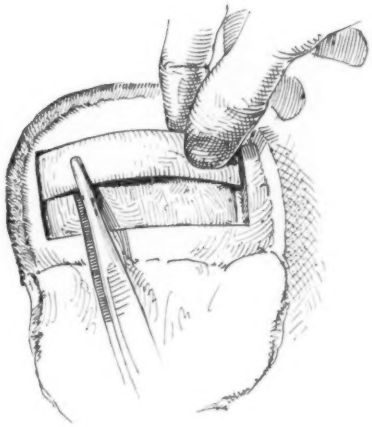


Fig. 9.

Fig. 6. Skull defect exposed by turning down quadrilateral flap and dura separated from periosteum around the edges of the defect.

Fig. 7. Fascia graft placed over exposed brain and pushed underneath bone edges.

Fig. 8. The slots are prepared for the reception of the bone grafts by driving chisel into the diploe. Insert shows the slot completed.

Fig. 9. The elastic bone graft inserted in slots to repair defect.

covered the defect while the boneless flap took the place of the former. The disadvantages of this method are that there is considerable hæmorrhage from the scalp and the diploe and the exchange of the flaps causes buckling of the pedicles. Chiefly, however, the spongiosa is laid directly upon the dura, which tends toward callus formation and causes subsequent cortical irritation. We have used the Koenig-Mueller method quite successfully, especially in Army work, sometimes combining it with transplantation of a flap of fascia lata to prevent adhesions between the brain and graft.

The objections mentioned to the Koenig-Mueller method led to the Hacker-Durante modification. Here a flap, consisting of periosteum

and outer table, was made near the periphery and then the pedicle twisted so that the periosteal surface lay next to the dura. The flap was not easy to make, the repeated hammering often produced cerebral concussion, and these flaps were liable to gangrene.

The French use cartilage grafts, introduced by Morestin. The advantage is that cartilage is more easily fashioned to the circumference of the cranium than is bone. Though the immediate results are good, there have been several instances recorded of complete or partial absorption of the graft, leaving the patient with the old dreaded sense of insecurity.

Leriche. Lyon chir., 1917, Oct. In one case operated on 36 days before, in one 1 year previously, the cartilage was replaced by connective tissue. In two other cases, after 5 months, the cartilage softened and did not give the same protection that bone did.

Wilson. Ann. Surg., 1919, lxix, 230. Cartilage graft inserted April 12. On May 15 the graft was "not as firm as it had been and there was some bulging on coughing."

Autogenous bone transplantation is now the method of choice in repairing cranial defects. The bone is most often taken from the tibia, but grafts have also been used from the rib, sternum, trochanter of the femur, wing of the scapula and spine of the ischium. For the reception of the graft, the outer table is beveled off for one-half inch at opposite edges of the defect and the graft held in place by sutures through holes bored through the inner table (Morrison), or by a lattice of sutures across the periosteum, or the ends of the graft are tucked in between the inner table and the dura (Nesselrode). Using one-half the thickness of a rib as a graft was first suggested for bone grafts in defects of the mandible (Gallie and Robertson).

Through the vicissitudes of opinion regarding just what happens to bone transplants, most observers agree that their fate depends upon the rapidity of blood supply plus the presence of osteoblasts (McWilliams[1]). Osteoblasts on and near the surface, in a position to absorb nutriment from the bathing lymph, are capable of living and proliferating. "At the end of ten days, proliferation of these osteoblasts, on the periosteal and endosteal surfaces, is well established. The circulation is re-established by the ingrowth of new blood vessels into the mouths of the haversian systems. This takes place with extraordinary rapidity. In small porous transplants it is complete in 2 weeks." (Gallie and Robertson.[2]) The rapidity with which these changes occur depends upon the size and density of the graft and the number of surviving osteoblasts on the surface. In large or dense grafts, requiring deeper or more difficult penetration for the blood vessels, absorption and replacement are necessarily slow.

These considerations have led Gallie and Robertson to assert that half a rib is the graft of choice except where support is wanted. They used it in repairing a loss in continuity of the mandible. Carter[3] has used a similar graft in rhinoplasty after the Italian method. Half a rib was transplanted into the arm and two weeks later an arm flap, with the contained bone, was turned into the nose defect. Brown[4], in Australia, reported a series of cases in which half-thickness rib grafts were used for cranioplasties, but his method differs from ours in many points, which seem to render the method used by us preferable. We operated upon our first cases in 1918 without knowing of Brown's article.

An ingenious method, recently described by Kreider[5] may be advantageous in certain cases. While operating upon a very recent, depressed fracture, two large bone fragments were removed and inserted subcutaneously in the hypochondrium for preservation. Seven weeks later, after infection had well subsided in the skull, the fragments with some adherent fat were taken from the abdominal pocket and re-implanted into the cranial defect, a good result ensuing.

The technique of our method is as follows:

1. We procure the graft by exposing one or two ribs on the side of the thorax through a flap incision. We use the sixth and seventh ribs, the middle of the incision being about the mid-axillary line (Fig. 2).

2. A quadrilateral piece of fascia is excised from the pectoralis fascia, somewhat larger than the skull defect to be covered (Fig. 3). This fascia is kept in a warm saline solution.

3. The rib is exposed by pushing the muscles aside. The periosteum is incised along the upper margin of the rib; then the outer half of the rib is chiseled off, leaving the inner half intact upon the pleura. This is done by chiseling along the upper margin with a narrow, thin-bladed chisel, splitting the rib gradually for the required distance (Fig. 4). After the rib is split throughout the length of graft desired, the graft is removed by biting through each end with strong bone scissors. The splitting need not be carried down to the lower or inferior edge of the rib (as figure shows erroneously). A very little caution will avoid entering the pleura.

[1] Surg., Gynec. & Obst., 1916, Jan.
[2] J. Am. M. Ass., 1918, lxx, 1134.
[3] J. Am. M. Ass., 1913, lx, 728.
[4] Med. J., Australia, 1917.
[5] J. Am. M. Ass. 1920, lxxiv, 1024.

Grafts can be taken from two and three adjoining ribs, if necessary for covering a large skull defect (Fig. 5). These grafts are also kept in saline solution, and the chest wound is closed in layers.

4. The skull defect is exposed by a quadrilateral flap. The skin is carefully dissected from the underlying adherent brain or dura, though the minute dissection of all scar tissue from the brain, advised by some, is not deemed necessary. The dura is separated from the periosteum around the edges of the defect and the edge of the bone taken away for one-quarter inch around the entire periphery, using a gnawing bone forceps or small chisel (Fig. 6). Irregular defects are made regular in outline to receive the grafts properly. The fascia transplant is next placed over the exposed brain, pushed underneath the bone edge and smoothed out. Sutures are not needed, in our opinion, to keep this fascia graft in place (Fig. 7).

5. The bed for the reception of the bony graft is now prepared as follows: On opposite sides of the defect the outer and inner tables are separated by driving the chisel lightly between the two, along the exposed edge of the diploe. With only a few strokes of the chisel a short slot is thus easily formed in the cancellous middle layer of the cranium (Fig. 8).

6. The rib grafts are put in place by simply inserting each end in the prepared slot. If the rib is made a trifle longer than the defect it will tend to curve outward, away from the brain, and will keep its position in the slot firmly because of its elasticity (Fig. 9). Two or more grafts can be placed side by side to bridge a large defect.

7. The skin flap is turned back and sutured in place.

ADVANTAGES

1. Both fascia and bone are obtained from the same location. In all other methods the fascia graft is obtained through a separate incision in the thigh or abdomen. Besides, the pectoral fascia, light, areolar, with fat adhering on both surfaces, is a better protection against adhesions than is the firm, fibrous fascia lata.

2. The rib seems to have a natural line of cleavage in its center. As the pleural half of the rib is left *in situ*, there is rapid regeneration and no rib defect results.

3. A graft consisting of only half the thickness of the rib has a considerable degree of springiness and elasticity to it (see Figure 5, insert). This allows it to be easily molded to the skull without the necessity of sawing half way through the graft at short intervals (Albee), as must be done with denser and thicker grafts to bend them. This impossibility of easily shaping bone grafts is the chief reason why Chutro and others prefer cartilage grafts. Our half-rib graft has this advantage over the cartilaginous graft without the disadvantage of being resorbed early.

4 The wedge-shaped slot fashioned in the diploe for its reception requires only a few strokes of the chisel. There is no bleeding as in exposing a wide area of the diploe, no foreign material is needed for fixation and the graft can be set in with curve enough to separate it from the underlying brain.

5. Brown's method does not include the fascia flap, which we think is important for preventing adhesions between graft and brain. He keeps the rib graft in place by a lattice work of sutures, which are difficult to take in the periosteum or galea and not comparable to the ease of fixating the grafts in slots.

Since writing this article, in the last number of *Archives of Surgery* (vol. 1, No. 3, 428), Dr. Leo Eloesser recommends rib-grafting for the repair of defects in long bones and mentions that "the rib is particularly well adapted for filling in cranial defects. The convexity fits in well with the curve of the cranium and gives an excellent cosmetic result." He gives no special technique, however, and his cases reported are all transplantation into long bones.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING, HELD DECEMBER 3, 1920, DR. WILLIAM FULLER, PRESIDING

ACUTE PARTIAL ENTEROCELE

DR. CHARLES F. SAWYER read a paper entitled "Acute Partial Enterocele." (See page 38.)

DISCUSSION

DR. COLEMAN G. BUFORD: I would emphasize particularly the importance of a point and the treatment of it, quoted by Dr. Sawyer in connection with the subject of partial enterocele. I refer to enteroceles occurring into drainage tubes used in the abdomen. He quotes two cases where this occurred, in which the glass drainage tubes had to be broken in order to liberate the gut. It would seem that my experience is worthy of recording.

About 1911 I attempted to do away with gauze drains and gauze wrappings for tubular drainage in the abdomen. I realized that there was danger of herniation of the gut and omentum into the fenestrations of tubes, and I, therefore, chose tubes with the distal ends closed and having very small lateral fenestrations. Several months passed without any difficulty, when upon withdrawing one of these tubes, I brought out with it a loop of intestine and found that there were three or four nipple-like projections of intestine within the drainage tube. These had become œdematous and it first seemed impossible for me to get them out without breaking the tube, but I was able to remove them without serious damage to the peritoneum by making gentle tractions. In fact, I was surprised to see how easily these came out. About 6 months later this accident occurred again, but on this occasion the tube was literally filled with protrusions of gut, each of which was swollen. I remembered my first experience and applied the same method of gentle, but slow traction, and released all of these without its being necessary to break the tube.

I will say, by the way, that I have seen only one partial enterocele following an operation. That occurred in the service of Dr. Fenger at Mercy Hospital about 1896 or 1897. He laparotomized a man who showed a permeable bowel, but persistent vomiting and abdominal distention. Several days after the operation, the wound was opened and a partial enterocele between sutures in the line of the abdominal incision, was found. His symptoms were relieved and the man recovered.

RESULTS IN THE OPEN TREATMENT OF FRACTURES

DR. JOSEPH SMITH, Wausau, Wisconsin, read paper entitled "Results in the Open Treatment of Fractures." (See page 45.)

DISCUSSION

DR. WLLIAM HESSERT: One of the last statements made by the essayist was that it was not good surgical practice to leave in a foreign body. I would like to ask him, when he closes the discussion, to tell us what his reasons are for making that statement. Personally, I leave the foreign body in, and do not take it out unless there is infection. Roughly speaking, in 100 cases in which I have used foreign bodies, I have had 2 cases of infection, one of the femur, and one of the fibula. In the case of the fibula the plate had to be taken out on account of infection, and in the femur the plate was taken out because a sinus developed.

Aside from these cases, I have made it a practice to leave the foreign body in. I have had no complaint on account of its weight. None of these cases has had the plate removed by other surgeons, so far as I know.

DR. EMMANUEL FRIEND: I would like to ask Dr. Smith how many cases of infection he has had in the 33 cases in which he used Lane plates. I am sure, my results from the use of Lane plates are not as good as his. A great many of them have had to be taken out.

DR. CHARLES E. KAHLKE: I would like to ask Dr. Smith as to the functional results obtained in the cases of Colles' fractures. We see too many of these cases coming with severe deformity, but the greatest distress seems to be to abandon fixation rather than have bony deformity.

DR. JAMES M. NEFF: This is the best paper I have heard on the surgery of the bones for a long time. Dr. Davis, who is present this evening, knows that in France we had a great many simple fractures of the bones that were plated. We used the Lane technique throughout and very rarely had infection. After plating these fractures we were able to send the patients over to England in a short time, instead of keeping them in France for a long time; we plated these fractures, put the limbs in casts, and sent the

patients over to England inside of 2 weeks. Those we did not plate had to be kept in France for several weeks. We plated every bone in the body, the clavicle, the long bones, the humerus, both bones of the forearm, the tibia, the fibula, etc. We have done a great deal of plating. We have plated the clavicle in a number of cases and have resorted to ring in some. In the latter I have adopted the method which I described in a recent paper on wiring of bones, particularly those fractures where there are small fragments. For instance, in the cases of Colles' fracture, where the fracture is produced by falling on the back of the hand, with a displacement forward and upward in some of these it is hard to reduce the deformity. We have had some of these cases where we have opened the parts and put in wire in accordance with Lane's technique and soldered the wire in place as I described in a paper read at Rockford, Illinois, some time ago. We have used silver and copper wire and soldered it, first tinning it and soldering it as the tinner would ordinarily solder wire. In that way we prevent breaking of the wire in twisting and have no unwieldy ends to deal with nor bend down afterward. We have employed this method in fractures around the elbow-joint; we have applied it to fractures of the clavicle and to Colles' fracture of the lower end of the radius. It seems to me, it is an ideal way to use either copper or silver wire in fractures of bones.

I agree with Dr. Smith regarding infection. We have had very few cases of infection where the Lane technique has been followed out to the letter.

Dr. N. M. Percy: Dr. Neff expressed my sentiments when he said that this was one of the best papers on fractures he had heard for a long time. I agree with practically everything Dr. Smith has said. It has not been my practice, however, to remove a Lane plate except when it makes trouble, or when there is a likelihood of its doing so. I cannot see any objection, however, to removing plates, provided this is done early, as Dr. Smith advises, so as not to prolong the period of disability. On the other hand, it has been my experience that plates, properly placed, seldom ever cause any trouble. The successful use of plates is purely a matter of technique. I have put plates on every long bone in the body, the interval since operation varying from a few weeks to 12 years. During the past 12 years I have plated 260 fractures and have removed the plates in 8 per cent of the cases. An acute infection has followed the operation in only one case. In some cases the plates were removed because of a mild infection resulting in a sinus formation a few weeks to 3 months after the operation. In other cases the plates were removed because they had been placed subcutaneously. It is our practice to remove all plates placed subcutaneously, especially if this region is subject to traumatism, as is the lower portion of the tibia. A plate placed deep under the muscles is seldom removed.

In observing Dr. Smith's slides, I noticed that in three cases in which there was a fracture of both bones of the forearm, he plated one bone and wired the other. It was noted in all three cases that both the immediate and ultimate results were more perfect in the bone on which the plate was used than in the bone which was wired. I would like to ask Dr. Smith why when he found it necessary to make a fixation of both bones, he plated one and wired the other.

Dr. Harry Jackson: I would like to ask Dr. Smith whether he has inserted any plates in compound fractures. I have had a few of these cases and I have not been able to hold the fragments by any other means than by Lane plates. In using the Lane plate in the deeper tissues I have been surprised not to get any infection.

Dr. Budd Van Sweringen, Fort Wayne, Indiana: It was my good fortune to see some fracture work in San Francisco a few years ago, and it was the practice there to remove the plates in all cases before the patients left the hospital.

In some of my own work I have found good reasons for removing plates. In the first place the screws become loose in a short time and the fragments are not held securely always. No matter how tightly they were put in at first a pressure atrophy occurs around them and we find them loose in a few weeks. If the plates are left in very long, as shown in the plates this evening, there is a piling up of callus, so that you have to chisel down in order to get at the screws and remove the plate. This excess callus often causes pain and if near a joint some stiffness. These plates can be taken out easily if it is done early and whether there has been clinical evidence of infection or not, there will be found some more or less fluid material about them with a staining of the tissues. I am inclined to think that in some cases we remove the plates too early. There is no doubt but that a plate delays union. Its presence operates in some way to delay the formation of firm callus.

Dr. Coleman G. Buford: There is one important phase of this subject which possibly we ought to pay more attention to, namely, the medicolegal aspect. The lawyers, who are trying these Lane plate cases, seem to have been impressed by the testimony of a few men to the effect that it is wrong to leave Lane plates.

I, personally, do not think there is any law that can be laid down as to whether this should or should not be done at a certain time after the operation, and I am sure there is no uniformity of belief about it, and each surgeon giving advice or testimony should be very careful to state the case in some such form to the counsel.

Dr. P. H. Kreuscher: I was glad to see Dr. Smith using the Lane plate in so many of his cases with such good results. A prominent surgeon recently made the statement that the Lane plate method had practically gone out of use. I have used the Lane plate in many cases with satisfactory results and shall continue to use i where I believe it is indicated. I was glad to have Dr. Smith show the picture of the case in which he had used the Parham-

Martin band. I have used it in 10 cases in the last 2 years and find it applicable in spiral fractures of the tibia, femur, and humerus. I believe it should be used in short oblique and spiral fractures as well as in long oblique fractures.

I do not remove the Lane plate unless there is definite indication. I have never used a plate on compound fractures in the presence of infection. I do not believe that the Lane plate gets loose if the proper screws are used in its application.

In the last 2 years, I have used wire staples in five cases of fractures near the joint. I used staples in one case last week where there was a fracture of the external condyle of the humerus; also used staples in another fracture of the shoulder-joint. In one case two staples were used, one at right-angles to the other. This held in splendid position the head of the humerus which had been entirely disconnected from the shaft, had slipped out through the joint capsule and lay underneath the pectoralis minor muscles.

DR. SMITH (closing): I am very much obliged to the gentlemen who have brought out so many interesting points in the discussion of my paper.

In reply to the question of Dr. Hessert as to why we removed the Lane plates, I think an examination of the slides shown will answer that question, at least in part. You doubtless observed that in those cases in which the plate was removed early there was very little deformity in the bone, and very little irregular callus. You also remember in those two cases in which the plate was not removed there was a good deal of irregular callus. I think we get much nicer and smoother healing, less rough callus, when the plate is out. The point raised by Dr. Buford is also worthy of consideration. There is another reason why the plate should come out, and that is, a certain number of these cases will have trouble with the plates. If the presence of the plate does not cause infection it may be painful. Patients occasionally complain of some discomfort if the plates are so located as to be subjected to trauma.

Another reason for opening up these wounds and removing the plates is that you will find the tissues where the plate has been in contact with bone somewhat discolored, and often there is a little necrosis, and for this reason it is a good plan to get rid of the foreign body and give the bone a chance to make a complete restoration to normal continuity.

Another thing that happened in one case was that a man had a plate that had been applied and left in; he fell and broke his leg again at about the same point, and the old plate made a great deal of trouble for us in reducing the second fracture. That may be an unimportant reason for removing it, but in this particular case it was rather important.

In reply to Dr. Friend's inquiry, I would say that in the 38 cases in which we employed the Lane plate, we have had no infection which caused any trouble. In one or two cases we have had a little seropurulent discharge, but not enough to cause any trouble. These wounds heal like perfectly clean wounds. Since the paper was written we have had one plating case, in which there was slight infection, but the 38 cases mentioned in this paper were not accompanied by any infection.

Regarding the cases of Colles' fractures, with malposition, Dr. Kahlke inquired about, one of them was lost sight of after reduction had been effected, and the other died a year or two afterward from influenza, but so far as we know the result of this operation for reduction of the malposition was quite satisfactory. The patient never complained of any disability.

Dr. Percy inquired why in double fractures we plated one bone and wired the other. I think chiefly for cosmetic purposes.

In reply to Dr. Jackson's question as to the use of Lane plates in compound fractures, at the present time we have three compound fractures of the leg in which we have used Lane plates, after a thorough cleaning out of the wound. If the plate is applied in a place which is accessible for removal, that is, near the surface, and screws are used barely long enough to go through the bone and not penetrate the marrow, it does not increase the danger of infection I believe it is a good deal better to put on a plate temporarily and secure a reasonable degree of immobilization than to allow the limb to dangle around without any fixation, especially in those cases where both bones of the arm or leg are broken. In our practice we have quite frequently employed a small Lane plate to secure reduction and maintain it until a plaster cast or some other fixation device is employed, even in open fractures, and we have not seen any worse results, so far as infection is concerned, in those plated than in those which were not plated.

In regard to the Parham-Martin band, as mentioned by Dr. Kreuscher, it is an ideal device for certain cases. I want to warn, however, against leaving the band in and having to remove it at a subsequent time. These bands may be difficult to remove. I remember one instance in which a Parham-Martin band was put on by some one else, and the patient came to us on account of pain and irritation, and we undertook to remove the band and found it was so completely buried in callus that its removal was an extremely difficult undertaking.

CHICAGO SURGICAL SOCIETY

REGULAR MEETING, HELD JANUARY 7, 1921, DR. WILLIAM FULLER, PRESIDING

DR. KARL A. MEYER read a paper on "Gunshot Wounds of the Abdomen."

PERTHES' DISEASE

DR. D. B. PHEMISTER: This case of Perthes' disease is of interest because it was operated on and the pathological changes in the head of the femur and hip-joint were determined, and because of the postoperative regeneration that followed curettage of the diseased focus in the femoral head.

C. P., male, age 10, entered Presbyterian Hospital March 1, 1920, with the following history: Onset 5 months ago with pain and limp in right hip, which did not confine him to bed. After 3 weeks he was put to bed with weight extension of the limb, which was continued for 3 months. For the last 6 weeks he has been free of pain and walking around, but considerable limp and limitation of motion persist. Examination showed slight limitation of flexion, but marked limitation of abduction and rotation in the right hip-joint; otherwise negative. Roentgenograms showed flattening and cavity formation of the center of ossification of the epiphysis of the head. The diagnosis of Perthes' disease was made, and the patient left the hospital without treatment.

He returned 4 months later with slight increase of the limp, but was still free from pain. Second roentgenograms showed marked increase in size of the area of destruction and further collapse of the center of ossification of the femoral head. Two small sequestra could be seen in area of destruction.

The hip-joint was opened and a mild synovitis with a straw-colored effusion and villus formation was found. A window was excised from the head of the femur extending into the center of ossification which had broken down in its lateral portion, giving rise to a cavity filled with granulations, necrotic débris and sequestra. The cavity was thoroughly curetted and the hip-joint closed.

Bacteriological examination and guinea-pig inoculations of the material removed were negative. Histological examination showed a mild chronic synovitis and quiescent inflammatory changes with small sequestra in the tissue removed from the broken down center of ossification in the head.

Following the operation there was rapid filling in by new bone of the cavity remaining after curettage of the disintegrated head, and 5 months after operation practically all traces of the cavity had disappeared. The pathological findings speak strongly for the infectious nature of the disease, and the postoperative regeneration suggests that operation may be the most desirable form of treatment.

DR. COLEMAN G. BUFORD: It seems to me that we are liable to confuse this type of cases clinically, with another group of mild hip disturbances which are believed to be at least one of the phases of coxavara in which there is a gradual separation of the head of the femur from the epiphysis with more or less destruction of one or both, and more or less rotation of the head. The X-ray plates of patients with this disease are very similar to those presented in this case of Perthes' disease, except that there is no sequestrum. I have wondered many times if these were not merely different pathological phases of the same affliction. If they are not the same pathological entity, then they must not be confused, as the clinical symptoms are so similar, for it is certainly true that those referred to as coxavara do very well upon non-operative treatment, and I should hate to see one of them operated upon in view of the results that may be obtained by prolonged immobilization in casts. I am familiar with the outcome of a few of these who have had this treatment and in whom the motion and usefulness of the limbs was very good and fully as satisfactory as we could expect from drainage.

A COMPARATIVE STUDY OF END-RESULTS OF CHOLECYSTOSTOMY AND CHOLECYSTECTOMY

DR. FRANK D. MOORE read a paper entitled "A Comparative Study of the End-Results of Cholecystostomy and Cholecystectomy." (See page 41.)

DISCUSSION

DR. A. J. OCHSNER: I can heartily subscribe to the statements made in Dr. Moore's conclusions, but there is a tendency at the present time to give the impression that, because there is considerable trouble with many patients after cholecystostomy, therefore we should perform cholecystectomy. For several years there has not been a week but what I have encountered several cases of cholecystectomy that have had as much or more trouble after this operation than they had before. In such cases the cause of the trouble is probably one or another of the causes that have been mentioned by the essayist. I believe that, instead of adopting cholecystectomy as the rule, we should adopt it only in cases in which we have a definite reason for doing it; namely, a diseased gall-bladder or cystic duct. Dr. Moore has mentioned a group of cases in which cholecystectomy is contra-indicated, in acute inflammatory conditions in which this operation would endanger the patient's life, and in which we can remove the gall-stones and give relief temporarily, and remove the gall-bladder later on in perfect safety. In that case a diseased gall-bladder is not an indication for a cholecystectomy.

I had a case today in which I removed the gall-bladder 2 years ago. There was present at that time a small amount of connective tissue which I considered harmless but that connective tissue has increased so as to obstruct the common duct entirely, and the woman has a fistula. I have no way of diverting this fistula into the intestine because the gall-bladder is absent. In a normal gall-bladder from which we have removed stones the cause of later trouble is malposition and kinking of the cystic duct because of a sacculated or pendulous gall-bladder, or the irritation that one causes by inserting a drainage tube into the gall-bladder at the time of operation.

I had my cases followed some years ago and found that nearly all cases of cholecystostomy in which I had tamponed the gall-bladder with gauze after the operation and removed the gauze on the sixth day, and did not put a drainage tube into the gall-bladder had no trouble afterward. But the cases in which a drainage tube was used, and there was a considerable number of them, had trouble afterward. The drainage tube had caused ulceration of the lining of the gall-bladder, and that in turn caused trouble afterward. The gall-bladder was damaged as the result of the technique used, but would not have been damaged if the other technique had been employed.

In the plan of overcoming the pendulous gall-bladder by attaching it to the transversalis fascia and peritoneum, we have found a method which will usually prevent further trouble. I believe if the gall-bladder is not diseased, it is well to leave it in.

Dr. Coleman G. Buford: To emphasize the importance of this subject, I cannot do any better than to quote the remarks of Dr. Ochsner in which he said that "Operators seem to take the position that because there is a tendency in many patients toward repetition of trouble similar to the original, they would not have had these troubles had the gall-bladder been removed." The taking out of gall-bladders to the extent that it has been done in the last few years, has probably been followed by more difficulties than when the gall-bladders have been left in. The pendulum has swung entirely too far in the wrong direction, and we as surgeons who have had a large experience in this field of work and who have had ample time to review our work and the work others have done in the last 15 to 20 years, ought to check up on this situation, and make the subject clear to those who have not had the same opportunities, and by so doing, we may possibly diminish the number of gall-b'adders that are being removed. It must be understood that in many of these cases, the infection was not primarily in the gall-bladder, nor could this have been true in half of the instances in which the gall-bladder was removed. On the contrary, the infection has usually been a diffused process throughout the bile-ducts including the terminals, and removal of the gall-bladder does not assist this in any way, but really, it limits the opportunity for prolonged drainage which is just the thing that we seek, and though we may at times get considerable drainage from the remnants of the cystic duct, should there be a recurrence of the difficulty for which we would need again to drain the biliary tract, most of the operators would find it pretty difficult to locate a source through which they might establish such drainage.

In the nineties, Fenger was doing a great deal of gall-bladder surgery. About 1898 he had operated upon 24 cases of common duct stone, while Dr. Senn, who probably did a very much larger volume of work had had only one. It must be remembered that the number of cystic duct and gall-bladder cases were many times more numerous than the common duct cases. I state this to show the volume of material which Fenger had to draw conclusions from. Shortly after I went with him I asked if patients who had stones removed from the gall-bladder did not again develop such stones. He remarked that he did not know and further stated that he was not having any of these patients come back and that he had several years of gall-bladder surgery behind him from which to form an opinion. I spent nearly four years in that clinic as first assistant, and almost all of the gall-bladder surgery came under my immediate observation, and I do not remember in all of that time of his having removed but two gall-bladders, nor do I remember having patients continually coming back complaining of their original difficulty. What was the reason for this? It was clear to us at that time that this was not primarily a gall-bladder difficulty, but a diffused process in the liver and that the liver needed drainage. It was also clear, from common knowledge of pathology, that a few days' or 2 weeks' drainage was not adequate, and therefore these patients often remained in the hospital 6 weeks and more instead of being hurried home, and the drainage tube taken out in a period varying from 4 or 5 days to 2 weeks. I believe it is this early removal of the drainage tube and the resulting inadequacy of drainage as to time, which is accounting for so many recurrences in the practice of some of the men. It certainly has not occurred in my practice where I have made it a point to drain for a long time.

Dr. Evarts Graham has substantiated the early assumption that this was a diffused difficulty by that splendid paper which he presented before our society 2 or 3 years ago in which he showed microscopic specimens taken from livers of nine patients with gall-bladder infection.

It is my opinion that there should be a definite indication in each case for the removal of the gall-bladder; that there must be extensive and permanent damage to the gall-bladder wall itself or to the cystic duct, to justify the operation of cholecystectomy.

Dr O. E. Nadeau read a paper (by invitation) entitled "Bone Metastases in Cancer of the Breast."

Dr. Arthur Dean Bevan read a paper entitled "Simplicity of Surgical Technique."

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN GYNECOLOGY AND OBSTETRICS

By GEORGE GELLHORN, M.D., F.A.C.S., Saint Louis

THE fourth edition of the *Operative Gynecology* of Doederlein and Kroenig[1] has just been published. Ever since its first appearance in 1905, this book has been a landmark in gynecology and the many thousands of gynecologists the world over who are acquainted with the work will agree with the statement that it has but few peers in modern medical literature. The authors were exceptionally well equipped for their task—both in the prime of life, both original thinkers and tireless research workers, brilliant operators as well as inspiring teachers to whom students would flock from all corners of the earth. Kroenig's untimely death a year or so ago threatened the continuation of his monumental work, but fortunately for us, Doederlein, as he remarks in the foreword, felt it his duty to the memory of his friend and collaborator to attend to the present edition. That this was no mean undertaking may be seen from the many changes and additions which the achievements of the last 8 or 9 years had made necessary and which have still further increased the already imposing size of the book.

The arrangement of the subject matter, however has remained essentially the same as in the former editions. The general part is constructed on a broader basis than is customary in works of this nature. It is based on the view that the general principles of operative technique, the pre-operative steps and the prophylactic and therapeutic measures after the operation may have more to do with final success than technical details. The problems of disinfection, of the illumination of the operating room, the choice of narcosis, the prevention of postoperative complications, a. o. are dealt with in this section. This part contains also a discussion on the effect of the removal of uterus and ovaries upon the female organism and the influence of gynecological operations upon the nervous system. Anybody who is familiar with gynecological literature knows that in this entire field the authors have either been pathfinders or that they have subjected to careful and extensive investigation suggestions that have emanated from other quarters. This general part of the book is, therefore, not merely a compilation of literature but a most valuable exposé of the subject based upon thorough scientific and practical critique. It is but natural that the extensive personal experience of the authors leads to individualistic expression, yet, everywhere do they give full justice to differing opinions of other writers.

This sympathetic attitude is equally well preserved in the second and larger part in which those gynecological affections are discussed which under certain conditions require operative treatment. The indications, technique, and results of the various operations are exhaustively presented in almost 800 pages. The gynecological operations in the strict sense of the word naturally receive foremost consideration, but the major obstetrical operations and those of the borderland of the urinary tract are also included. Finally, the principles of abdominal surgery are represented in the description of the typical operations on the stomach, intestines, and gall-bladder so as to meet the practical needs of the gynecologist.

Hardly ever has study been made as alluring or the teaching of good operating been presented as clearly and attractively as in this book. There is no encyclopedic dullness, but the selection of the best in gynecological surgery, and this best is given to us in a beautifully simple and fluent language which bears no resemblance to the massiveness and involved sentences that mar so much of scientific German writing. Even a superficial knowledge of German will suffice to follow the text, and if a word should be wanting here and there, a glance at the magnificent illustrations, which must be the envy of every textbook writer, will clear up any doubt. Indeed, the reading of this book is an unadulterated pleasure, and it is no overstatement to say that the work is truly indispensable to the modern gynecologist and surgeon. It is, therefore, fortunate that the comparatively moderate price of this beautifully appointed book of more than 1000 pages makes its acquisition possible to wide circles, particularly among American readers.

IN Anspach's *Gynecology*[2] we greet a new and noteworthy addition to our list of American textbooks. In an introduction, John G. Clark to whom the work is dedicated, very aptly characterizes it as one in which the literary references are selected with great care and successfully combined with the observations gathered from the author's matured

[1] Operative Gynaekologie. By A. Doederlein and B. Kroenig. 4th ed. Leipzig: Georg Thieme, 1921.

[2] Gynecology. By Brooke M. Anspach, M.D. Philadelphia and London: J. B. Lippincott Co., 1921.

experience. Thus a well-balanced textbook has been constructed that will admirably well answer the needs of the student and practitioner. The general plan of the book follows approved lines. The first four chapters contain the fundamental facts of embryology, anatomy, and physiology of the female genitalia which are essential to a full under standing of all gynecological problems. Then follows a short but very good chapter on the causes of pelvic disorders. The technique of arriving at a diagnosis by means of a careful anemnesis and the various methods of general and special examination is given in five chapters. The examination of the urinary tract and the lower rectum receive special attention commensurate with the importance of these organs to the gynecologist. The next seventeen chapters deal with the diseases of the various organs in which we are interested; in each of these the etiology, pathology, symptoms, and treatment are systematically and succinctly discussed. Separate chapters are devoted to such subjects as gonorrhœa, tuberculosis, syphilis, etc. The chapter on backache proves that the author never loses sight of the relation of the genital organs to the entire organism. A very attractive chapter is that on the hygiene of adolescence and the relation of neuroses to pelvic disorders. Operative technique and postoperative treatment are presented without undue detail, yet, in a concise and instructive manner. The chapter on mechanical and medicinal aids to treatment deserves particular notice in these times when gynecological treatises all too often overemphasize the surgical aspect of our specialty. The chapter on radiotherapy, finally, presents to the reader a clear résumé of the present status of this question.

The general appearance of the book is most pleasing. The numerous illustrations are well chosen and instructive. A very commendable feature is a bibliography at the end of each chapter. These references are apt to stimulate the desire for consulting the original sources and well illustrate the care with which the author has prepared his work. It is quite certain that this book will gain many warm friends among teachers as well as students.

ON reading the *Operative Gynecology* by Crossen[1] which has recently appeared in a second edition, it is easy to see why this book has achieved the popularity which we predicted in our review of the first edition.[2] Simplicity of diction and good drawings make every step of the various operations described plain to the reader and teach impressive lessons in successful operating. Where there is so much that is excellent, it is perhaps unnecessary to point out particulars; but the reviewer can not refrain from calling special attention to the chapter on radical abdominal hysterectomy for cancer. In this most difficult of all gynecological operations the successive steps are exceptionally well described and depicted, and the surgeon about to attempt this operation, will find himself well repaid by freely consulting the book. Another distinctive feature is a complete classification of all operations for retrodisplacement and prolapse, together with brief historical data. These operations group themselves into several categories and of each, one or more representative methods are given in greater detail and with the same lucidity, both graphic and pictorial, on which we have commented above. Aside from testifying to the great industry of the author, these two chapters are of signal importance in that they show the reader in how many different ways the problems of retrodisplacement and prolapse may be approached surgically. We continually talk and teach nowadays of individualization in therapy; but when it comes to actual practice, is it not a common observation that in the treatment of the two conditions mentioned many operators have one pet method, preferably one of their own invention, which is employed more or less in all cases? It is the old, old story of theory and practice re-enacted. Anybody with experience knows that the special pathology may be different in any two cases of the same disease, that in each one different problems may have to be considered; in short, that the patient to be operated upon is entitled to a selective treatment fitting her individual needs. In such a selection the book before us should be of immense value; but the beginner may well be bewildered by the multiplicity of methods that are presented to him. Some years ago there appeared in a Continental journal a review on the subject in which were listed 154 different methods, or modifications of methods, for the operative relief of retrodisplacement. This number has probably increased by now. Many of these procedures have definitely been discredited, others are still *sub judice*. It would simplify matters and materially aid the student to hear from a man of mature judgment something, at least in a general way, of the advantages or, better still, the proven disadvantages of the various methods; and the necessary space might well be obtained in the next edition by condensing the rather long chapter on ovarian transplantation.

THE fact that the second and enlarged edition of Green's book[3] has not been delayed by the war, indicates the value of the work and the well-merited esteem with which it was received. The author has chosen the form of case histories to illustrate pathological conditions characteristic of the five periods of woman's life, viz., infancy and childhood, puberty and adolescence, maturity, the climacteric and anility. Each of these sections is preceded by an introduction, and each case history is followed by an epicrisis in which the lessons to be learned

[1] Operative Gynecology. By Harry Sturgeon Crossen, M.D., F.A.C.S. 2nd ed. St. Louis: C. V. Mosby Co., 1920.

[2] Surg. Gynec. & Obst., 1915, xxi, 539.

[3] Diseases of Women Including Abnormalities of Pregnancy, Labor and Puerperium. By Charles M. Green, A.B., M.D., Boston: W. M. Leonard, 1920.

are emphasized. In this form of teaching there is no thought of substituting for textbooks—rather is it intended to give a very desirable supplement to bedside instruction and home study. Another strong point in the book is the attempt at closely linking together the sister sciences of obstetrics and gynecology. We have already commented upon this point in our review of the first edition.[1] The study of this book may be recommended not only to the student but also to the practitioner and the specialist, for each will profit from the wide experience of the author.

THE attention of gynecologists and obstetricians is hereby called to a small monograph[2] by Herbert Spencer, of London, in which the well-known author puts on record his experience, extending over a period of 32 years, with tumors complicating pregnancy, labor, and the puerperium. Thirty-seven cases of fibroids are reported in detail, Of these, 5 were treated by abdominal myomectomy; 5 others were subjected to conservative cæsarean section; and in 6, cæsarean section was followed by hysterectomy. Two women died from sepsis; 1 patient died, before operation, from intestinal obstruction due to nipping of the ileum between two subperitoneal fibroids. Fifty-five cases of ovarian cysts were operated upon in pregnancy, labor, or the puerperium; 44 others were not subjected to operation. Only 1 patient died. Ten cases of cancer have been observed. In 3 of these, high amputation of the cervix was performed after delivery and these patients have remained free from recurrence for 25, 22, and 19 years respectively. All other patients died. Space does not permit the recounting of details regarding diagnosis, interrelation of tumors and pregnancy, the fate of the children, etc. Suffice it to say that we have here an extremely valuable contribution on a most important subject.

BERKELEY and Bonney are among the most prolific writers in the field of gynecology and obstetrics, and their books reflect a wide personal experience. Here is the third edition of their *Difficulties and Emergencies of Obstetric Practice*.[3] The many good points of this book have been acknowledged in a previous review to which the reader is referred,[4] and which were summed up in the statement that the book is very pleasing and will be read with profit by obstetricians, young and old. It may be added here that the views expressed and the methods advised are, with but few exceptions, highly individualistic and as such they are of particular interest even though there may be a divergence of opinion here and there. There is, for instance, a peculiar position which the authors prefer for bimanual examination, where "the patient lies on her side with the cross axis of the pelvis oblique whilst the shoulders are nearly horizontal, the trunk being somewhat twisted at the waist." The authors believe that Abderhalden's test has no diagnostic value. The height of the fundus at 4 weeks of pregnancy is given as being 2 inches above the symphysis—a statement with which few will agree. In the treatment of the pre-eclamptic and eclamptic periods the authors favor prompt operative evacuation of the uterus, preferably by cæsarean section. Very little stress is laid on expectant therapy, and the Stroganoff method with its remarkably good results is not even mentioned. These actively surgical tendencies of the authors reveal themselves also in the problem of exophthalmic goiter in pregnancy where they recommend evacuation of the uterus prior to any operation on the thyroid. It will be remembered that the conservative school following Winters' lead, holds that by a timely thyroidectomy many a child may be saved. The treatment suggested for puerperal inversion differs in some essentials from the general usage; narcosis, for instance, which is commonly considered the best protection against shock, is not considered absolutely necessary; neither is the placenta, if still adherent, to be removed until the displacement is rectified, nor the exposed surface cleansed before reposition. Interesting observations were made on 200 patients delivered in "twilight sleep"; labor was prolonged, the use of the forceps was more often necessary, the percentage of ruptured perineum was higher, and the failure of occipitoposterior position to rotate normally was commoner. "When born in a condition of oligopnœa the child should be placed in its cot and left alone. There is no doubt that some practitioners, failing to recognize that the child is really not in danger, have applied vigorous methods of resuscitation with very bad results." As regards obstetrical disinfection, the authors regard "violet-green," a member of the aniline group, as ranking foremost among the non-irritating, yet powerful antiseptics.

This selection might be extended considerably but it will suffice to indicate that the specialist in obstetrics will read this book with a great deal of interest.

PARTICULAR attention is called to this *Report*[5] in which 22 papers by members of the staff are reprinted. This volume shows not only the valuable clinical research which the staff members have conducted in addition to their routine duties, it also reflects the appreciative attitude on the part of the Board of Directors composed of laymen who seem to be in closest co-operation with their medical staff and in cordial sympathy with their problems. Other Hospital Boards, please copy!

[1] Surg., Gynec. & Obst., 1916, xxii, 634.

[2] Tumours Complicating Pregnancy, Labour, and the Puerperium. By Herbert R. Spencer, M.D., B.S., F.R.C.P. London: Harrison & Sons, 1920.

[3] The Difficulties and Emergencies of Obstetric Practice. By Comyns Berkeley, M.A., M.D., M.C. (Cantab.), F.R.C.P. (Lond.), M.R.C.S. Eng.), and Victor Bonney, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.), M.R.C.P. (Lond.). Philadelphia: P. Blakiston's Son & Co., 1921.

[4] Surg., Gynec. & Obst., 1915, xxi, 540.

[5] Report of the Scientific Work of the Surgical Staff of the Woman's Hospital in the State of New York. Edited by George Gray Ward, Jr., M.D., F.A.C.S. Vol. II, 1919.

THIS Nursing Manual[1] contains a great deal more than its title and its purpose would indicate. In fact it is so complete that any medical student who knew all there is in it would pass through examination with flying colors. The mere fact that the book has appeared in nine editions since 1903 proves that it has been a trustworthy guide to the trained nurse. There is an exceptionally clear and simple exposition of the matter, and everywhere is the nursing aspect properly emphasized.

To teachers of obstetrics for nurses the book opens a new trend of thought at this time. We may have wondered sometimes whether we have not been overtraining our nurses; whether or not less information about the segmentation of the ovum and more regarding painless catheterization had been in order, less of fœtal circulation and more about resuscitation, less of internal or external rotation and more regarding the care of a patient in an eclamptic convulsion. And now that the "obstetric attendant," this glorified sort of an upstairs maid, has appeared on the scene, greater emphasis on the purely practical aspect of obstetrics will be still more desired. For this new category of helpers, books such as the present volume and others of like type seem almost too erudite, and "first readers" in obstetrics will have to be written in words of one syllable. Let us hope that the existing scarcity of nurses will soon be remedied so that the American nurse may maintain her high standard for which she is justly famous throughout the world.

IN the meantime there is all the more reason for redoubling our efforts to educate the prospective mother. There is an abundance of "guides for mothers" on the market, and their very number indicates that the public is eager to read and to learn. The little book before me[2] seems admirably well suited to satisfy every demand on the part of the laity. It gives the prospective mother just what she needs—not too much as unfortunately many of these "guides" do; and, furthermore, it uses plain, straight English. In the entire volume, there are but two technical terms—"hypersecretion" and "toxic"—which remain unexplained, and these might easily be replaced by simpler words in the next edition. There is sound and practical advice throughout the little work, and the sympathetic and encouraging tone in which it is written makes it very likable. Not the least valuable part of the book is an appendix with directions about household remedies and reparation of diets. In the prenatal and postnatal care of his patients the physician will find this booklet of great assistance.

[1] A Nurse's Handbook of Obstetrics. By Joseph Brown Cooke, M.D., 9th ed., revised and enlarged by Carolyn E. Gray, R.N. and Philip F. Williams, M.D. Philadelphia and London: J. B. Lippincott Co., 1920.

[2] Maternitas, a Book Concerning the Care of the Prospective Mother and Her Child. By Charles E. Paddock, M.D. Chicago: Cloyd H. Head & Co., 1920.

AMERICAN COLLEGE OF SURGEONS

SOUTH AMERICAN SURGEONS

REPORT OF OFFICIAL VISIT TO PERU, CHILE, ARGENTINE, AND URUGUAY IN BEHALF OF THE AMERICAN COLLEGE OF SURGEONS, BY FRANKLIN H. MARTIN, M.D., CHICAGO

FOREWORD

AGAIN we are upon the comfortable ship *Ebro*, drifting down the Hudson River, passing the great skyscrapers and the Statue of Liberty. As we wave farewell to the Palisades, with their snow-capped columns, we realize that we are leaving the January winter of the United States and are started on our voyage to the southern continent and a summer climate. While the Statue of Liberty is still bestowing her silent blessing upon us, the liberty-loving Americans are gathering in the comfortable smoking room and drinking toasts to the snow-bound inhabitants of dry America.

This is the beginning of a tour of two surgeons and their wives to the countries of South America, primarily for the purpose of creating a closer friendship between the members of their profession on the two continents, and, secondarily, to become familiar with their forms of government and with their institutions of learning, to enjoy the novel scenes among which they live, to participate in their home life, and, above all, to learn the secret of their charming courtesy.

This is the writer's second trip to South America. It is a natural sequence to repeat the trip to that continent because of the inexhaustible things of interest with which a surgeon comes into contact on a first visit. The medical men of South America have not awaited our coming, but have perfected themselves in the art and science of medicine and surgery until they have no peers; and now, with dignity and seriousness, they are ready to interchange visits with us and to receive us with all of the cordiality and graciousness of their cultivated natures.

The visit of Dr. W. J. Mayo and the writer, which was made last year, included Peru, Chile, Argentine, and Uruguay. It was undertaken for the purpose of interesting the surgeons of these countries in the American College of Surgeons, and extending to them Fellowship in the College. Our mission was most pleasant and most successful and our advances were received with enthusiasm. Seventeen surgeons of Peru, thirty of Chile, sixty-three of Argentine, and fifteen of Uruguay were presented as candidates for Fellowship in the College by committees of surgeons that were established in each of the countries. It was with the greatest regret that we were unable, on this first visit, to make personal acquaintance with the profession of Brazil, Ecuador, Colombia, Venezuela, Bolivia, and Paraguay; but the lack of time and limited transportation facilities made it impossible.

Now, with Dr. Thomas J. Watkins of Chicago as a companion, we are visiting Peru, Chile, Argentine, and Uruguay again, and Brazil for the first time, while, through the good offices of Dr. F. J. Corrigan of Cleveland who preceded us, committees have been established in Ecuador and Bolivia, which countries will be visited later by the officials of the College. We also hope to include Venezuela, Colombia, and Paraguay.

I. THE VOYAGE

The voyage to South America, if undertaken in January or February, brings the traveler to Chile and Argentine during their summer vacation months. However, there is compensation in the fact that it enables one to escape the severest months of our winter; it affords a long, delightful, comfortable sea voyage in tropical waters; and it enables one to enjoy in those southern countries a climate similar to that of Southern California in the same months.

We sailed from New York on January 29. After two days of cool weather, but a comparatively smooth sea, we enjoyed the sunshine and warmth of the Florida coast, with St. Augustine, Ormond, Daytona, Palm Beach, and Miami easily discernible. On the fifth day we anchored in Havana Bay, lunched in Havana, and had a hasty bird's-eye view of this old and interesting city.

II. Isthmus of Panama

1. *The Canal*

On the morning of February sixth our ship steamed into the harbor of Colon and we landed on the Isthmus of Panama. Small clouds on the horizon obscured the sun and the flat lands of Colon were not yet in sight. At eight o'clock the low lines of the coast appeared and the shipping of Colon came into view. War ships and commercial ships from all over the world were everywhere about. We took on the pilot, the quarantine officers, and the customs men, and slowly slid alongside one of the large, substantial, clean docks.

As we approached this gate to the great watercut we enjoyed the same beautiful scenes we had looked upon previously—the coast-line of billowy, feathery green of the jungle, with here and there a two-story, red-roofed, screened-in government employee's residence, a hospital or an office building, and royal palms occasionally projecting above all like great feather dusters.

In Colon we observed "the system," which is exemplified in the well-built docks, and the loading and unloading, icing, and cooling facilities furnished alike to the ship traffic of the entire world. Shortly we took a special train for our ride across the Isthmus. Our first stop was at Gatun Locks, just to the east of Gatun Lake, which is twenty-eight feet above the Atlantic Ocean. From this vantage point we looked about and saw the great spillway that carries off the surplus water, and that also creates the electric current that furnishes light and power for the gigantic machinery of the Panama Canal; the attractive towers from which the operators control by electric buttons the seemingly intricate mechanism; the traction engine and the engineer who guides the various ships through the great Locks that will accommodate any vessel, regardless of size; the emergency gates standing idle waiting for the unforeseen. However, the real charm is in the warm and balmy atmosphere, in the soft blue mist, in the little mountains which extend north and south and connect the mountain ranges of the two Americas, in the velvety sward that we walk upon, fashioned by nature from fern-like grasses and the little vine with the miniature purple daisy, in the watch-like perfection of it all, in the little villages with their red-roofed houses the white fronts of which are covered with red and purple bougainvillea, all guarded by royal palms and buried in ever-growing tropical green. While many of the miniature mountains were cleared of growth in the construction of the Canal, a carpet of smooth green remains and extends to the water's edge.

We skirted the great lake created by the overflow and were fascinated by the dead trees on whose tops rested orchids and other parasitic growth. We disembarked from our train and went through Culebra Cut on the little submarine chaser, the *Gold Star*. The quicksand-like bottom of the Cut is being elevated continuously by the pressure from the mountain-hills on either side, and there is nothing to do but scoop out the earth with their great dredges, either until there is no bottom or until the two mountains have been hauled away. After passing through the Cut, we again boarded our train and passed through the slip to the Pacific. Everywhere are the purple mist, cleanliness, and signs of the careful husbandman. It is here that Gorgas did his magnificent work in building an everlasting monument to the people of the tropics. As it was once the pestilence spot, it is now the health garden of the tropics.

2. *Panama*

We passed through Balboa with its new administrative buildings of Spanish architecture, and the Ancon Hospital resting on the terraced hill, and arrived at the Panama station, whence we were hustled to our hotel, the Tivoli. All we had seen on the Isthmus was beautiful when last we viewed it, but on this second occasion there was no disappointment; it was more beautiful than ever. Surely Panama must become one of the great resorts of the world.

After luncheon we drove through Balboa, out to Fort Amazon, and over the causeway which has been built from the earth taken from Culebra Cut to the nearby islands that are so wonderfully fortified for our protection. Looking back, we saw low-lying Panama with its attractive towers and its substantial Spanish architecture. On our return we drove through the streets of Panama. As this was the week preceding Lent the carnival, which is celebrated in all Latin-American countries at this time of the year, was in full sway. Beautiful children, and young men and women with skin of all shades, brilliantly dressed but in good taste, were here holding forth in innocent gaiety.

We saw our numerous friends, and on the following day inspected the new site for the St. Thomas' Hospital, visited other points of interest, and later had luncheon with our professional friends on the broad balcony of the Union Club, which overlooks the Pacific.

3. President Belisario Porras—Gorgas Memorial

By appointment, we called on Señor Belisario Porras, President of the Republic of Panama. The purpose of my interview with the President was to discuss with him the proposed memorial to General William C. Gorgas, a memorial that will be an object lesson to the people of the future; that will typify that great man's character; and that will carry on the work that his genius has organized and that his industry has so successfully administered.

Señor Porras is sympathetic to and is taking the initiative in a plan that would establish in Panama such a monument — a great laboratory in which could be conducted a research in tropical diseases; a working place that would attract the distinguished research workers of the world; a school that would disseminate to the practitioners of medicine from all countries the knowledge that would be required by its workers.

In this country the plans are being developed by Rear Admiral William C. Braisted, M.C., U.S.N. (Retired), and Señor Don J. E. Lefèvre, Chargé d' Affaires, Panama Legation, Washington.

At four o'clock our staunch ship quietly slipped out of Balboa Harbor. It was early enough to enable us to watch the new city of magic beauty, Balboa, and the romantic old city lying farther to the south, Panama, slowly disappearing on the horizon as we steered among the fortified islands of the Canal's entrance toward the southern continent.

III. Peru

1. Lima

With five days of perfect sea and a delightful temperature, we sailed straight past Colombia to the head-lines of Ecuador, where in our imagination we saw Guayaquil which until two years ago was one of the last strongholds of yellow fever, and where our Gorgas accomplished his final successful work. We crossed the Equator and continued south to the romantic land of Pizarro—Peru, where at Callao, the seaport town of its famous capital, Lima, we disembarked for two days of pleasure and profit. During our stay in Lima we were the guests of our friend, Dr. Juvenal Denegri, at his home in beautiful La Punta, a summer suburb of Callao and Lima.

A luncheon was given for us at La Punta on the afternoon of the first day of our visit in Lima. The same evening we were the guests of the Sociedad de Cirugia del Peru at a banquet held in the Botanical Gardens of Lima.

We were kept very busy exploring this romantic city, which was the center for the Spanish adventurers who conquered Peru and destroyed an ancient civilization. We visited the Cathedral where lies the conqueror and the conquered, Pizarro, and the museums in which are preserved the relics of the Incas; we viewed the mountain sentinels that surround this old city, the narrow streets, and splendid monuments; we took a sea drive along the rugged coast, and listened to the cheer of children; we admired the stolidity of the Indian police, absorbed the atmosphere, and enjoyed the charming friendship of the interesting people. In two days we endeavored to accomplish the impossible—gain an impression of Peru's historical and physical charm.

2. President Augusto B. Leguia

Through the courtesy of our Ambassador at Lima, I was afforded the pleasure of an interview with Señor Leguia, President of Peru. Señor Leguia, who knew General Gorgas personally, was most enthusiastic about the proposed plan to erect a memorial to General Gorgas at Panama, and volunteered his active support.

3. Mollendo

In the evening of Sunday, February sixth, we sailed south on a smooth sea. The temperature was delightful, about seventy to eighty degrees Fahrenheit, with pure, dry, stimulating atmosphere in a territory where no rain has fallen for many years. We were fanned daily by the cool breeeze of the Humboldt Current, which kept us comfortable and keen to enjoy our long deck hikes. The rugged coast of the continent and the coast range of mountains were constantly in view, and we had occasional peeps at the snow-capped Andes beyond. Our next stop was at Mollendo, a Peruvian outlet from Bolivia.

IV. Chile

1. Arica—Tacna—Iquique—Antofagasta Valparaiso

The following day we stopped at Arica and enjoyed a trip across the desert to Tacna. We also had one day each at Iquique and at Antofagasta, the export depots for copper and potash. At Antofagasta we met friends who were anxious to hear from us northerners the story of the day.

Sunday, February thirteenth. Early in the morning we sailed into the Naples-like Bay of Valparaiso and saw in the distance a smoky haze over the city. As the sun cleared the mist and revealed the city in the curved indentation of the sea, it became apparent to us that something unusual was happening. We heard the booms of guns and shortly discerned the faint

bray of bugles and the fainter tones of smaller instruments. We wondered if this was a welcome to the voyagers of the obscure SS. *Ebro* on which we were approaching. If so, it was a royal welcome, because with a nearer view we noticed that the terraces of the city were crowded with the people who cheered and waved flags. However, we were soon disillusioned and made to realize that our ship was not the object of all of this attention, for in the opening to the harbor stood a great black hulk which proved to be the Chilean monster war vessel, *El Torre*, that had just arrived from the shipyards of England. Close to it, flylike, were a multitude of smaller steamers, and around them smaller launches and row boats. The new battle-ship stood out majestically, its rigging and decks covered with men and officers at attention for the welcome of a proud nation.

Valparaiso, the seaport metropolis, and Santiago, the capita lof Chile, were before us to be explored during the coming few days. A delegation of old friends boarded our ship early in the morning and told us of the program for our one day's stay in Valparaiso and then left us for a little time. At one o'clock they returned and with them in full regalia for the festive occasion of greeting the new battle-ship, was Dr. Alberto Adriasola, the Surgeon-General of the Chilean Navy. It was good to look upon his handsome face again. There appeared also the inevitable newspaper men with their batteries of cameras.

We were tucked away on the Admiral's launch and wended our way to the battleship, *El Torre*, where under the chaperonage of the Surgeon-General and under the conduct of the Commander of the ship, we inspected it from its keel to the conning tower. It was an inspiring sight to look down from the dizzy heights of the ship upon the hundreds of smaller craft that were there to give welcome, and off to the shore-line of the curved bay where appeared the terraced heights. The day had become more beautiful with sunshine and great fleecy clouds, and a temperature like our fresh June days of the north.

2. *Viña del Mar—President Arturo Alessandro*

When we had fully enjoyed the great ship we were taken ashore, and in automobiles drove through the suburbs of Valparaiso, passing along the stately avenues which were lined with handsome villas, the summer residences of the society of Chile, and on to the most wonderful of race-courses at Viña del Mar. It was a gala day at the races as a Prince of Spain was occupying the President's box, close to which were our seats. The races were beginning, and disregarding tips we placed our bets, and with the luck of the inexperienced, won.

In the promenade we met Dr. Amunategui of Santiago and other friends of last year. While walking with one of the charming señoras the band began to play and everyone stood at attention. It was the national air; the President had arrived. Naturally we were desirous of seeing him, and the Señora said: "You shall meet him." She took us to him and introduced the members of our party, as he stood unostentatiously under a large tree. He seemed more pleased than bored, and attempted a few words in English. He, Arturo Alessandro, has been in office but a couple of months, and he is astonishing the old conservatives by his democratic ways. He insists upon going about, apparently unattended, although the Señora said he was constantly under the surveillance of secret service men. From appearances, he might on this day have been any one of a thousand well-dressed, unofficial holiday citizens instead of the Chief Executive of a great nation.

We received an invitation to attend the ball which was being given that evening in honor of the Prince. This was very tempting as all of the society of Chile would be present; but we were obliged to reluctantly decline.

Back to the race-course we wandered and watched with interest the great crowds of people as they surged about the track and the grandstand during the race, and when the race was finished, as they rushed to the promenade where champagne corks popped in the restaurants and gaiety was everywhere manifested by these Latin people.

3. *Surgeon-General Alberto Adriasola*

Our hosts then drove us back toward the city, and after driving about its edge we entered upon a valley road, from where we climbed to the heights above the town and finally emerged at the entrance to an attractive villa which was situated on a terrace above the drive. We walked up the steep winding path, on either side of which were flowers, shrubs and tropical trees, to General Adriasola's home. Here we met his charming family—his wife, daughters, sons, and son-in-law. Our greeting was such as we had learned to expect from these people of the south—so warm, so gracious, so friendly. This charming family captivated us, and I have never known a father and a mother who seemed to have more to make them satisfied.

The view from the balcony of this home was most inspiring. Far below us lay a panorama of

Colonel Henry Clay Fisher, M.C., U.S.A., Chief Health Officer, Canal Zone, Panama.

Dr. Francisco Graña, Professor of Surgery, Faculty of Medicine, University of San Marcos, Lima, Peru.

Valparaiso Bay with its mass of shipping. The entire fleets of the nations could anchor here within plain view. Indeed, only a week previous to our arrival our own Pacific Fleet was anchored in the Bay, and the charming señoritas pointed out to us where this or that favorite Yankee battleship had lain. They had sailed away within a fortnight, and who knows how many fair Chilean hearts were hidden in secret recesses of those ships?

After tea we took a last look from the upper balcony. The sun had fallen into the Pacific; a brilliant glow covered the sky and gradually faded; and as darkness came on a planet appeared, then a thousand twinkling lights, outlining the city below like sparkling jewels.

4. Banquet at Union Club

Awed and silent we drove down to the city with our friends. To make our welcome even more impressive, a waning moon came into view over the eastern mountains, and in its familiar appearance and charm we were brought back to earth. At dinner at the Union Club we met the surgeons of Valparaiso and their wives, a charming company in whose society we passed a most interesting evening.

At midnight, and as a climax to this great day, our friends took us in their launch to our ship which was anchored a half mile out. The Bay was flooded by the moonlight, and above us shone the Southern Cross, reminding us that we were far from home. But around us was abundant evidence of new found friends who would endure for all time.

5. Valparaiso to Santiago

Early the following morning we bade adieu to our good ship *Ebro* and were taken ashore, where we boarded a train for Santiago, the first arm of our trip over the Andes. The green of the fields and the colors of the flowers were heightened by a heavy dew. Our gradual climb through the valleys of the foot-hills of the mountains of this narrow country was an ever interesting panorama of hamlets, fields of corn, alfalfa, wheat

Dr. Guillermo Gastañeta, Professor of Clinical Surgery, University of San Marcos, Lima, Peru.

Dr. Miguel C. Aljovin, Professor of Gynecology and Clinical Gynecology, University of San Marcos, Lima, Peru.

and oats, and extensive pastures on which well fed cattle and horses were grazing. On the terraces of the hills and on the slopes were many varieties of fruits—mangoes, melons, nectarines, peaches, oranges, lemons, pineapples, pears, alligator pears, plums, apricots, and luscious grapes. We followed the beds of rivers and smaller streams which in March are not over-full. Our train skirted hillsides and gave us an everchanging view of the valleys and glimpses of the second range of hills, with the real mountains beyond and an occasional view of snow-capped premiers still farther east. At the hamlets the natives, many of them half-breeds, were displaying their wares—fruits, bread, and cakes of all descriptions. Along the road-side were adobe or bamboo huts often thatched with palm leaves, and in the open spaces about the huts congregated innumerable children and dogs.

6. Santiago

By many meanderings we passed over one range of hills and finally dropped into the valley that holds, like a gem on a Princess' bosom, the capital city of Chile—Santiago. We recognized it by the island-like mountain, Santa Lucia, a sentinel in brilliant uniform which, with distinction and dignity, stands guard in the center of the city.

While in March one can view at leisure natural and artificial beauties of this Capital, the society and important professional and business inhabitants are away in the mountains or at the seaside. We viewed the beauties of nature and explored the curious things of this Latin city, drank in the pure, dry air of its valleys, and were inspired by its mountain sentinels that have guarded the valley through the ages.

V. The Andes

1. Santiago to Los Andes

On the third day we boarded our train which followed a mountain stream and climbed into the foot-hills which constantly became more and more rugged, until we finally faced the backbone of the Southern continent, the Andes! The trip from the coast at Valparaiso to the coast

at Buenos Aires is made in three stretches, the first from the coast or Santiago to Los Andes, Chile, a small city well up in the foot-hills of the western edge of the real Andean mountains; the second a fourteen-hour daylight trip from Los Andes over the Andes by a narrow-gauge cog railroad to Mendoza on the Argentine side; and the third a twenty-two hour trip from Mendoza to Buenos Aires on a broad-gauge train with sleeping and dining cars attached.

At five o'clock we reached Los Andes, which is an attractive city with much green foliage, water running through the streets, and clean pavements of cobble-stones. A plaza or park, with a promenade and a band-stand, occupies a central location, and here all the citizens congregate, some of them well dressed and refined in appearance, others the peasants, many of them half-breeds in picturesque, highly colored costumes.

The hotel, which has clean, cubby-hole rooms, is built about a concrete-floored patio in which an elaborate dinner was served out of doors under electric light. This was indeed a welcome ending to an interesting day.

2. *Los Andes to Mendoza*

As the time would be too short for this daylight trip over the Andes if one started late in the morning, it is begun from either Mendoza on the Argentine side or from Los Andes on the Chilean side at six o'clock in the morning. The narrow-gauge train of three passenger coaches and a well-stocked commissary car awaited us in the court-yard of our hotel. It was a cheerful if a sleepy group that climbed aboard, all full of anticipation for the great scenic experience of their lives. The little train, business-like, began its upward journey. A raging stream from the mountains dashed impatiently about the great boulders, the ambitious waters throwing spray which in the sunlight made innumerable rainbows. At this level a wealth of low-hanging willow trees bordered the banks of the river, and in the fields and on the mountain sides were trees bearing bananas, oranges, and many strange, unknown fruits. Almost immediately we were in the midst of rugged, rocky peaks, the bases of which were green but the tops bare and sharp. The train plunged through tunnels, traversed shelves of rock, crossed valleys, only to find another shelf or another valley beyond; but constantly reached higher levels. Shortly many snow-capped peaks came into view, and in many recesses of the mountains where the sun rarely penetrated were piles of snow and miniature glaciers.

Dr. Alberto Adriasola, Chief Surgeon, Naval Hospital, Valparaiso, Chile.

Only a foolish and ambitious writer would attempt to describe a mountain scene; and it is an ambitious traveler who after one or two trips can remember the varied details of a ride over the Andes; and photographs are but a meager reminder and an aggravation.

After struggling through a labyrinth of smaller but impressive mountains, traversing smaller valleys, and following many rushing rivers (any one of which if properly harnessed would furnish power to operate the whole Andean system of railroads), the little train emerged in a wide, placid valley in which is located a little hamlet through which a flat river winds its way. The whole valley might be located in New England, its surface is so undramatic. On a pile of lumber sat an American woman caring for her child, an attractive little tow-head who was playing with improvised toys. The husband and father was undoubtedly an American engineer who busied himself in an attempt to find a way of transforming the unlimited power of the Andes into American dollars.

But the beautiful valley lying in the sunshine is but a resting place for nature before she shows the sightseer what she really can do to astonish him. Some one called attention to the giant mountains ahead, to the great fields of snow that spread down to our very feet, to one opening and still another a half mile above us. Between these openings which penetrated the heights we could see the little shelf dug out on the mountain side, and were reminded that that was where we were going. Still farther above us, near the clouds, was another shelf constituting one more great switchback to guide our frail train to still higher levels. Within a half hour we were looking down from the first shelf to the placid valley where the little child was still playing, and within an hour we were gazing back from the upper shelf, from where we could see the trail, a zig-zag little ribbon of bareness worn out of the eternal rocks representing the trail of the traveler in the older day before the railroad was constructed. All about us were the giant mountains, and while we were nearly two miles above the sea level, they still towered above us in their majesty. At this height we emerged into another valley in which, between the peaks, as if in the palm of the Creator, was the beautiful Inca Lake, five miles long and three miles wide, surrounded by masses of broken rock that some volcanic convulsion had tossed into the breach. We climbed from our train to get a nearer view of this distinguished body of water with the blueness of the Monday rinse, and drank in its beauty and its solitude. Climbing still higher, we finally reached a little barracks and the customs house that marks the border of Chile. Here we entered the tunnel that connects Chile with Argentine.

VI. Argentine

1. The Christus—Aconcagua

This tunnel through which we were passing is one of the great engineering wonders of the world. It is two miles in length, and has the distinction of being at as great a height as it is long. In its construction the estimate and actual chainage were practically identical, while the floor levels from the two sides met almost exactly. On the Argentine side were the customs house officials of that country, and as we alighted some one pointed to a depression between two heights under which we had tunnelled where stands the Christus, a gigantic statue erected by Chile and Argentine as a symbol of perpetual peace.

As we began the descent on the Argentine side, we saw beside the road-bed a little stream two feet wide, the head waters of the Mendoza River which at its mouth is a mile in width.

Soon after crossing the summit the train creaked to a stop. "All out to see the premier peak of the North and South American continents." We were now among the elect. All around us was a group of great ones. As is true in looking upon a group of distinguished men, it was difficult in such an assembly to pick the most distinguished. Mount Aconcagua, a long, low, range-like monster covered with snow, forty miles away, does not stand up in so satisfying a way as does Shasta, which although only one-half its height has the advantage of being a great mountain among small ones. Aconcagua is a giant among giants.

2. Puenta del Inca

A few miles farther on we disembarked at Puenta del Inca, an Argentine mountain resort frequented by the society of Mendoza and Buenos Aires. An attractive hotel occupies a space above the little valley, and all about it tower the mighty peaks of the Andes. Close to the hotel is an interesting natural bridge which spans a boiling river, and there are hot and mineral springs which are utilized as medicinal baths. The walk from the station to the hotel in the altitude leaves one breathless, but if of a strong heart, keen for the good things of the table which are served at the hotel.

Having satisfied the inner man we began our descent and followed the little stream that was growing lustily into a rushing torrent. We remembered that last year, at one point, the end of a passenger coach was protruding from its turmoil, demonstrating the insecurity of our shelf on the mountain side, especially as above us in an almost perpendicular line were granite walls, ready to send down an avalanche of rock which would carry with it the trivial work of man. In contemplating the wonders of this trip, one has great difficulty in deciding whether to admire more the work of nature or the work of man. In many places and at many times one may see duplicates of this great scene; but I doubt if there is a place on earth where for fifteen consecutive hours one may traverse a mountain range and see the constant development of marvellous scenes like those of the Andes, with the premier peak of a continent almost constantly in view as a basis for comparison.

In the afternoon sun the bare cliffs on the eastern descent present not only the usual grandeur but a symphony of startling color—deep reds, deep and pale greens, deep and pale purples,

and yellows in a riot of shades, while above is the blue sky with great fleecy clouds caressing ambitious peaks. As the twilight falls, with the sun apparently setting many times as we curve about among the mountains, we are awed into silent contemplation by the wonder of it all. Finally darkness descends and the stars and planets seem near enough to touch. One year ago, as we approached Mendoza, we looked up from one of the deep valleys through which we were passing and there in the distance, in the light of a full moon, not disappointingly as in the noonday, stood, boldly and in great majesty, Mount Aconcagua with a panoply of glistening snow and ice. It was a fitting climax for the last scene of a great drama. Night rolled down the curtain, and we sped into the city.

3. *Mendoza*

Tired and hungry, we transferred to a broad-gauge, solid train of the continental type which consisted of comfortable compartment sleepers and two well-stocked diners. The linen was clean, the waiters keen, and the food delicious and welcome to a group of tired people who, each in his own way, had "taken in" the Andes.

Mendoza, the wine center of Argentine, its fields for miles filled with growing vines loaded with purple fruit, is a well-lighted, modern city. Its altitude makes its climate attractive for the people of Argentine during the hot months of the year. Although unusual for this season, a terrific rain had fallen for twelve hours, and had, they told us, extended east over the normally dusty pampas. Water stood in the low places of the streets, rushed through the irrigating ditches, and everywhere was delicious freshness. This presupposed a peaceful sleep, with fresh air filtered of all dust.

4. *The Pampas*

When we awoke in the morning, our train was passing quietly over the flat plains. The roads were wet, and large fields covered with water stretched in every direction. While eating our breakfast we could see from the window myriads of wild fowl. At several places great flocks of flamingoes flew away and circled back to light again upon the water after the train had passed. These creatures, as large as swans and graceful in outline, with a wing spread of from three to four feet, are of the most beautiful scarlet, and as they leave the water and fly in flocks one can only liken them to great flames of fire.

The pampas are endless, and for hundreds of miles they are as flat as a billiard table. They produce everything that will grow in Nebraska, Kansas, or Iowa. The pampas grass, tall and graceful with its plume of white, is everywhere noticeable. There are miles and miles of grazing lands, with thousands of cattle, sheep and horses. Occasionally we saw flocks of ostriches which like colts in a Wisconsin field ran away in mock fright as the train appeared, displaying a wealth of fluffy feathers that would make a Fifth Avenue milliner turn green with envy.

There are not many towns, and few comfortable farm houses. The land is owned by non-residents, and the tenants evidently have neither the inclination nor the authority to demand the comforts that are enjoyed by the farmers of our own western and central states. At any rate, it so appears to the casual traveler. Country roads, which might attract the automobile tourist, have not yet been constructed in Argentine.

5. *Buenos Aires*

The approach to Buenos Aires is similar to that of all large cities — through a preliminary preparation of more and more pretentious suburbs. Buenos Aires, the metropolis of South America, impresses one as does any great cosmopolitan city of beauty in the world. Its people are well dressed, courteous, and have the appearance of prosperity; its streets are well paved and clean; its vehicles of transportation (automobiles, electric cars, wagons, etc.) are similar to those of Paris, New York, or London; its hotels are continental; its public buildings imposing and attractive; its parks numerous, well kept and accessible to everybody; its monuments are artistic and full of meaning; its opera houses and theaters not unlike those in the continental cities where art prevails; and the commercial spirit is in abeyance. The newspaper men, while persistent, are considerate and enterprising; the cab drivers are alert but possess the same speed mania that seems to have taken possession of the world; the streets are adequately policed, and the traffic regulations are enforced. The city administration must be efficient.

We were met by friends and driven to the Plaza Hotel, which was not new to us as we had spent a pleasant week there last year. It was rather like going home, and the friends and flowers that welcomed us made us feel that it was home.

The guide books are filled with descriptions of things that one must see in Buenos Aires; but the outstanding impression of any city is the atmosphere that it creates for the visitor. In the evening, through the French windows of our room in the hotel, we could see the swaying trees

in the Plaza San Martin, with its live oaks and other green foliage, the lights and shades heightened by the electric lights, and beyond the uniform sky-line of Mansard roofs, all of which made us think of Rome or Paris. In the morning this same Plaza has a renewed fascination, the early riser sitting on a bench in the shade reading his newspaper, the walks being swept, the dew glistening on the leaves of the trees, and the flowers abundant and fresh, and through the branches of the trees a vista of the equestrian statue of San Martin with his outstretched arm urging his warriors on over the Andes. Later in the day as one walks through the broad arched walks of this park the world is awake and hundreds of little children in small groups, with their playthings and their white-garbed attendants, are making a harmonious symphony with their little treble voices, and one soon realizes that there is no race-suicide in this sunlit, Catholic country.

There are many places where one may go and absorb interesting impressions—the Avenida Florida, a shopping street about twenty-five feet wide with three-foot walks on either side, where are the shops, the finest in the city. On this narrow thoroughfare, a mile and a half in length, are many of the principal trading places, the famous Jockey Club, and a number of the palatial residences of the older inhabitants which are gradually being crowded out by the encroachment of business houses. The street is packed with vehicles going single file in either direction until four o'clock in the afternoon, when all traffic is prohibited and the sightseers and shoppers overflow from the side-walks into the street. In this thoroughfare at one time or another one will see everybody worth while in Argentine, and judging from the costumes and faces and languages, any one worth while in the broad world.

At one end of the Avenida, near the small park, are several of the old palatial residences, large iron gates admitting to the court-yards back of the five-story plain fronts being the only signs to indicate that there is habitation within. In one of these lives our friend, Dr. Herrera Vegas, a distinguished surgeon of South America. Beyond the iron gate one sees the patio of growing trees and plants, and the garage. At the side of the entrance is the porter's room where the friend or the stranger is received, inspected, and admitted. The plain walls surround a wealth of comfort and a palatial home. Hence the Avenida Florida, the Fifth Avenue of Buenos Aires, houses many interesting things, and while its reason for being is its wealth of shops, its charm exists in the people who live in it or who come and go to it.

On Sunday afternoons society drives in a section of the boulevard Avenida de Mayo or in one of the large municipal parks. Up and down they ride in a continuous procession, meeting those going in the opposite direction, and at the end of the boulevard turning and repeating the drive. Here in the season, between the hours of five and seven, everybody must be seen. It is the time for the entire family to appear and at its best. I was fortunate in witnessing this wonderful display with an interesting Argentine who could point out and inform me about the people we were seeing.

6. El Tigre

Another impressive and distinctive feature in the environs of Buenos Aires is El Tigre, an interesting freak of nature which transforms a large area of land contiguous to the Rio de la Plata into a group of small islands. Natural waterways, varying from twenty to two hundred feet in width, have made of this area of land and water a symmetrical checker-board, which extends for many miles. On the islands created by the waterways are estates with handsome homes, orchards, flower gardens, wharfs, and bathing places, while in the surrounding channels are myriads of motor boats, row boats, and pretentious yachts. This wonder of nature, twenty miles distant from Buenos Aires, is one of the summer resorts of the metropolis and may be reached by boat, tram car, railroad, or automobile. We were taken in an automobile by Dr. Frank Pasman and Mr. Wilson. The trip made in this way is most enjoyable as it follows more or less closely the river, traverses some interesting towns, and passes many attractive estates. The whole country about this southern city is one beautiful garden in which is grown everything that gladdens the eye and aids in the sustenance of life.

On arriving at El Tigre we visited an attractive Rowing Club and then embarked on a smart little motor boat with a canopy to protect us from the sun. Because of the regularity of the turns, and the symmetrical division of the land into islands without number, one almost duplicating the other, it was difficult to realize that we were traveling otherwise than in a circle as we traversed mile after mile of the water passages. However, each island was a new creation with its distinctive home, its distinctive dock, its distinctive foliage, its distinctive flower garden,

Dr. Alfonso Lamas, Professor of Clinical Surgery, University of Montevideo, Uruguay.

Dr. Juan Pou Orfila, Professor of Clinical Obstetrics, Faculty of Medicine, University of Montevideo, Uruguay

and its distinctive orchard. Often great weeping willow trees obscured the shore line and beyond one caught glimpses of a villa, and at other places peach, plum, quince, or other fruit trees spread their boughs over the water's edge, tempting one to pick and eat.

For two or three wonderful hours we explored this Venice-like territory. Once we disembarked at an island that was owned by a friend of our host. We visited the flower gardens, the vegetable gardens, the vineyards loaded with luscious grapes, the chicken farm, and then the playgrounds and the tennis court. Later in the afternoon we landed at an attractive dock and here, at a little tea house, we sat and had our tea, sandwiches and fruit.

Mr. Wilson then took us to what he called his "shanty," a comfortable bungalow located on one of the smaller islands, where he has everything for which his heart could wish to make life worth living. A large friendly dog met us at the dock. Within the house we were introduced to the Señora and other friends and children, and in the grounds surrounding the house we saw the chicken yard, bee-hives, a vegetable garden, and an abundance of flowers; everything trim and beautifully kept. Each morning after his plunge and his fruit and coffee Mr. Wilson goes to the station in his motor boat as we go to our suburban stations in our automobiles.

El Tigre is one of society's retreats; but the people of the great city are privileged to enjoy the unusual beauty of the place. A large hotel and an amusement pavilion occupy a site on one of the principal waterways near the tram and railroad station, and from here at frequent intervals excursion boats make a tour of the principal water avenues. Our day at El Tigre with our charming hosts was one long to be remembered.

7. *An Estancia*

Upon another day we were the guests of Señor and Señora Miles Pasman, whom we found to be most interesting people. They speak English perfectly and have the appearance of substantial New Yorkers. They were both born in Argentine,

but of parents who had but a short time before migrated to that country from New York. Their son, Dr. Rodolfo Pasman, is one of the distinguished surgeons of Buenos Aires, and their nephew, Dr. Frank Pasman, another young surgeon, has recently married one of their daughters. They wondered if we would enjoy an afternoon motor ride to their country place. Our delightful experience of the year before, when we had visited the *hacienda* of Dr. Herrera Vegas, made us anxious to go with our new found friends to this estate, which they so modestly called "a camp." There were two machines, and our ride took us out of the city a distance of about fifteen miles. The "camp" proved to be an estate of many acres with many buildings for the proper care of their large family, places for the care of live stock, a poultry yard, power plants, swimming pools, and tennis courts. In the conservatories are found every modern structure to care for a comprehensive botanical garden, in which not only a specimen of all South American trees and shrubs are housed, but also under careful cultivation many of the plants of other climes, all properly labeled and cared for by an enthusiastic expert head-gardener with an army of helpers.

The house, a charming residence of manor house capacity, located in a large park-like portion of the estate, was one of the surprises of this mere "camp." But the glory of it all came when we began to meet the family. A number of daughters and daughters-in-law were enjoying the hospitality of the "camp"; and then came their children, ranging from babes in arms to dignified young men and women sixteen and seventeen years of age, all glad to see grandfather and grandmother. Everywhere one looked were these attractive grandchildren, each one a beauty, each one with distinctive characteristics, but each one a little aristocrat. Thirty-seven of them there are, and the proud grandfather has a standing offer of a bonus of one thousand dollars in gold to the mother of each additional one, with the stipulation that the bonus is automatically increased until the forty-fifth grandchild will bring a super-handsome solace. What a reproach this family is to our practical, barren people!

Inspection of the estate under the guidance of our enthusiastic host and hostess and their daughters, tea with the delightful grandchildren assisting at the function, good-byes, and the drive back to the city with the automobiles filled with flowers, left us with a picture of the home life of the best people of this purple country that excited our intense admiration.

8. Zoological Gardens—Señor Clemente Onelli—Señor José Luis Cantilo

We spent a most interesting afternoon in the Zoological Gardens under the guidance of its founder and director, Señor Clemente Onelli. This wonderful garden has been the life-work of Señor Onelli, and to him the people of Buenos Aires owe an inestimable debt of gratitude. At tea time we were joined by His Excellency, Señor José Luis Cantilo, the Municipal Intendente, a most interesting and agreeable man. He is the chief executive of Buenos Aires, and is untiring in his work for his city, being personally interested in all of its activities, including its hospitals. Later he sent us tickets for a great open-air municipal concert, given on Sunday evening in one of the parks and attended by thousands of people. Both the Intendente and Señor Onelli were most thoughtful and courteous in their attentions to the ladies of our party.

9. Argentine Jockey Club

On Sunday, Dr. Robert Halahan took Dr. Watkins and me to the golf club, where we enjoyed playing over a very attractive course. The ladies joined us at luncheon, and later we attended the races at the Argentine Jockey Club. Although it was out of season, the races were most interesting, and we could well imagine how much of a society show-place it is in the height of the season. The race-track, with its comprehensive equipment and club houses, and members' stand of unrivalled beauty, has made the Argentine Jockey Club one of the great sporting clubs of the world. The receipts from this enterprise, over and above the necessary expenses for up-keep, are distributed among well deserving charities.

One naturally visits the Plaza del Congreso, a great court of honor with garden plots, fountains and statues. In one direction, along the Avenida de Mayo, a great thoroughfare carved into the old city, is the President's Palace, and in the other, with an imposing approach, is the National Capitol. (This street was not named for our distinguished surgeons, but for the month of May in which, in 1810, occurred the declaration of independence of Argentine.)

10. President Hipolito Irigoyen

I had the privilege of an audience with Dr. Hipolito Irigoyen, the distinguished President of Argentine. My object in visiting the President was to convey to him information about the memorial to General Gorgas which is in con-

templation for Panama. I found my distinguished host very sympathetic to the project, and fully acquainted with the work and reputation of General Gorgas. The President has a very charming personality, a strong physique, and a dark serious face. My interview with him, which was conducted with the Secretary of the American Embassy as interpreter, was extremely interesting and satisfactory, and I felt that I had added one more influential link of friendship to the Gorgas memorial.

On approaching the palace, and while awaiting the time for my appointment, I was particularly struck with the gaudiness and quaintness of the uniforms which are worn by the guards. The Secretary of the Embassy who accompanied me said that these men are the guards of honor to the President; that they belong to the Mounted Grenadiers, a corps that was famous in the time of San Martin, and that they have the privilege of wearing the same type of uniform that was worn by the veterans under that famous warrior in the war for independence.

The many beautiful fountains and groups of statuary scattered throughout the parks and in the open spaces form one of the greatest attractions of the city. At the time of the centennial of the independence of Argentine in 1910, the principal nations of the world presented monuments commemorating the event, and of them the Spanish monument is the most conspicuous, while the United States is represented by a dignified statue of George Washington. However, one seldom sees a vantage point in this beautiful city without something that will appeal to one's artistic taste. There are no bare spots and no glaring defects. Fortunately, nature here embellishes so rapidly with its foliage and its flowers that sordidness and abandoned spots never prevail.

11. La Plata

We visited of course La Plata, the capital of the Province of Buenos Aires. The city itself, like our own Washington, was planned along ambitious lines, and a motor ride through its wide streets lined with palatial government buildings, universities, national museums and other public buildings is much worth while. After driving through the city proper at the time of year when the University is closed one gains the impression that it is an abandoned city. Visiting it, however, as we did last year we gained a happy impression of the capital city and its environs. At that time we were the guests of the Faculty of the University, and were taken in motors from Buenos Aires to La Plata by our friends, the extensive *hacienda* of one of whom we visited on the way. La Plata, from a commercial standpoint is fast becoming famous for its packing houses, established by Americans commonly known as Swift, Armour, Morris, and Wilson.

12. Luncheon of American Club

Everywhere in Buenos Aires one recognizes American and other English-speaking people. Last year Dr. Mayo and I became guests at the weekly luncheon of the American Club of the city. This year Dr. Watkins and I were invited to fill a "return engagement." It was inspiring to meet about three hundred English-speaking business men of Buenos Aires in the large banquet hall of the Plaza Hotel. The group impressed one as would a great human dynamo; scarcely a man among them was over forty-five years of age, and many were very much younger. The southern climate apparently had not changed their natures, as they were alert and clean-cut in appearance. The American Club has assumed the task of acting as a board of censors or credentials on Americans who come to Buenos Aires to do business. Adventurers or dishonest bluffers are not wanted, and there is a genuine desire on the part of this organization to secure for the American business man the respect of the Argentine. And while they are doing business in Argentine, like the Englishman, they remain loyal and devoted to their own country.

We were the guests of this Club on the fourth of March. Therefore, in concluding my short response as their guest I reminded them that at one o'clock when I began my talk a great President of their country had retired from an honored administration. At the mention of Mr. Wilson's name they all arose and applauded for a full minute. At the close of my remarks I said that now a new President had assumed control, and, not as Republicans or Democrats, but as Americans, I suggested that they drink a health to the new President, Mr. Harding, to which they responded with the same enthusiasm as before and arose and drank. One cannot overestimate the influence of an organization like the American Club.

One short week in Argentine is only an aggravation to the visitor. It is a great country with several states, with several large provincial cities, and with a people that are almost as diversified in their interests as are the people of the United States. There is no provincialism manifested in them, nor in the appearance of their institutions. It is one of the principal countries of the world, and it is governed and inhabited by a cultivated, proud, and patriotic people.

13. Buenos Aires to Montevideo

We said adieu to our friends in Buenos Aires, and moved on to Uruguay. Our palatial steamer carried us away from the docks of the metropolis city and we were prepared to again look forward to visiting the capital city of that prosperous and well-governed country.

This entire region is saturated with the romance which it has inherited from the adventurous navigators who so shortly after the discovery of North America explored every river, bay, and harbor of this southern continent, and in an early day sailed into the Rio de la Plata, hoping to find a passage between the continents. As we approached Montevideo by the light of the following day, the first object that came into view was the little mountain from which the settlement that was established here more than five hundred years ago received its name. On this broad river we drifted into the harbor created by superior engineering ingenuity and landed at a modern dock.

VII. Uruguay

1. Montevideo

Dr. Garcia Lagos, Dr. Enrique Pouey, and Dr. Juan Pou Orfila, three surgeons whose acquaintance we had made last year, were our hosts this morning. They met us at the dock and carried us across the city to our hotel, which faced the sea on the other side of the peninsula. We were comfortably located in pleasant rooms with balconies that overlooked one of the popular bathing beaches.

At three o'clock in the afternoon we were taken for an automobile ride by Dr. and Señora Pou Orfila, who were our gracious hosts on several occasions. Professor Pou Orfila is one of the distinguished gynecologists of Uruguay who, we hope, will honor us with a visit to the United States during the coming year. We drove to Pocitos, one of the beach resorts close to the city, then along a new boulevard that is under construction, and which when finished will skirt the river for many miles. It is called the Rambla Wilson, in honor of ex-President Wilson. At Pocitos the Rio de la Plata is many miles in width and is really an arm of the ocean. A long swell constantly breaks upon its beach, not unlike that of the ocean itself.

In the few days at our disposal in Montevideo, between professional duties, we were very busy visiting the many points of interest. We took a trip to "El Cerro," the famous Spanish fort on the hill, near which has been built the Swift Packing plant. We motored to the new Carasco Hotel which will soon popularize another fashionable beach resort. We drank tea, inspected the beach, watched the roulette players in the attractive casino which is a part of the hotel, and returned home over the Rambla Wilson. It is curious to note that this little progressive Republic recognizes and is indirectly a patron of roulette and other games of chance. Several casinos are conducted, or at least countenanced and licensed, by the municipality of Montevideo, and excess profits from this source are devoted to the maintenance of charitable institutions.

We were anxious to see some of the surgeons at work in their hospitals, and accordingly at seven forty-five on the morning of the third day, Dr. Watkins and I were taken by Dr. Lagos for a clinical visit. Dr. Lagos speaks English perfectly and acted as our official interpreter and guide during our sojourn in Montevideo. He is thoroughly in touch with the medical profession of Uruguay.

2. Dr. Alfonso Lamas

We proceeded to a small private hospital, conducted by Dr. Alfonso Lamas, where we saw him perform the first operation of a two-stage procedure for hydatid cyst of the lung, under local anæsthesia. The pleura opposite the cyst was opened through a trap door created by removing a portion of the rib. An aseptic plastic adhesion was anticipated, a closed track established, and the cyst drained at a later date, à la Bevan's operation for abscess of the lung. Dr. Lamas quoted Dr. Bevan frequently and gave him credit for the idea. This surgeon showed us his record of the case, his X-ray findings, and every evidence of the most careful diagnostic routine. He operates as do all of the South American surgeons whom we have seen, with the French technique. We had nothing but the greatest admiration for the work of this surgeon, and found that he had operated upon a large number of hydatid cysts of the lung which are very prevalent in the southern portion of South America.

3. British Hospital—Italian Hospital—Dr. Alfredo Navarro

Later we went to a well equipped British Hospital where Dr. Lagos does his work; also to a new Italian Hospital, one of the show-places of medical Montevideo, which is built along very artistic lines and is the last word in modern hospital construction. We then visited the large civil charity hospital which is closely connected with the medical department of the University, and saw several operations by Dr. Alfredo

Navarro on an old man who was suffering with acute obstruction of the bowel. The case had been well worked up with elaborate records, laboratory tests, and X-ray findings. Everything about the operating room indicated that good, safe operating was the accustomed routine. The acute obstruction in the patient in question was a complication of a chronic obstruction caused by a neoplasm in the sigmoid. A colostomy was quickly and skillfully performed under high spinal anæsthesia. He then operated on a second case for simple appendicitis. His technique was French, his assistants handing him the instruments, threading needles, and sponging the wounds. This procedure is necessary because they have not the advantage of our nursing organization. However, there was a very efficient helper present in the form of a strong, intelligent woman who brought supplies, hand washes, and did the rough work about the room. Dr. Navarro has an interesting personality and the appearance and actions of our own late Nicholas Senn. A round ligament operation was performed in an adjoining room by two of the assistants in gynecology. The technique was thoroughly up-to-date, and the operation could nowhere in the world have been performed with greater skill.

4. President Baltasar Brum

Through the courtesy of Mr. Robert E. Jeffery, the American Minister to Uruguay, I had the pleasure of an interview with the President, Señor Baltasar Brum, a young man, apparently not more than thirty-five years of age, who possesses a strong and agreeable personality. Dr. Browning, a gentleman to whom I am under great obligation, acted as my interpreter.

My object in seeing the President was to bring to his attention information about the proposed memorial to General Gorgas. As this memorial will undoubtedly take the form of an institute for the study of tropical medicine, he showed a sympathetic attitude.

5. Banquet and Reception, Parque Hotel

A very pleasant diversion and a function that flattered Dr. Watkins and me was a dinner given to us at the Parque Hotel by some of our surgical friends of Montevideo. Our table occupied a conspicuous place in the center of the main dining room and recalled to my mind a similar luncheon that was given to Dr. Mayo and me during our one day's visit the year before.

Later in the evening, in the ballroom of the hotel, a reception was tendered to Mr. Jeffery, our American Minister who was about to return to the United States. We were present and had the pleasure of introducing some of our friends to Mr. Jeffery and the other members of the American Colony with whom we had previously become acquainted.

6. Ideal Climate

Montevideo is located in a semitropical latitude on a peninsula which projects into the southern Atlantic. It enjoys a delightful Summer climate, and lies far enough north to be beyond the frost line, so that the winters cannot be severe. The city is thoroughly modern, and its municipal and national governments are keen to the advantages of modern sanitary regulations. Its water supply is wholesome and pure, its streets are well-paved and clean, and almost the entire circumference at its water's edge is swept by the wholesome waters of an inland sea in the form of a great fresh water river. Our short visit to this city has convinced us that it would be one of the most delightful of South American cities in which to live.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

Eleventh Annual Session, Philadelphia, October 24-28, 1921

GEORGE E. ARMSTRONG, Montreal, *President*
JOHN B. DEAVER, Philadelphia, *President-Elect* ALBERT J. OCHSNER, Chicago, *Treasurer*
FRANKLIN H. MARTIN, Chicago, *Secretary-General*

THE CLINICAL CONGRESS IN PHILADELPHIA

PLANS for the eleventh annual session of the Clinical Congress of the American College of Surgeons to be held in Philadelphia, October 24-28, 1921, are developing rapidly under the supervision of the local committee on arrangements. The general plan of previous sessions will be followed, with operative clinics and demonstrations in the hospitals and medical schools during the morning and afternoon hours of the four days, Tuesday to Friday inclusive, and with scientific meetings each evening in the ballroom of the Bellevue-Stratford Hotel. At the opening session—the presidential meeting—on Monday evening in the ballroom, the John B. Murphy Oration in Surgery will be delivered by Dr. William J. Mayo of Rochester.

A program of clinics and demonstrations that will fully represent the clinical activities of that great medical center is being prepared by an executive committee composed of the following Philadelphia surgeons: George P. Mueller, Chairman; Damon B. Pfeiffer, Secretary; George M. Coates, J. D. Elliott, John H. Jopson, Floyd E. Keene, W. Estell Lee, William T. Shoemaker, J. E. Sweet, and B. A. Thomas.

In this program all departments of surgery will be represented, including gynecology, obstetrics, orthopedics, urology, surgery of the eye, ear, nose, throat and mouth, experimental surgery, surgical pathology, roentgenology, etc. A preliminary clinical schedule will be published in an early issue.

Clinics and demonstrations are to be given at the following medical schools and hospitals: University of Pennsylvania, Jefferson Medical College, Temple University, Hahnemann Medical College, Women's Medical College, Children's Homeopathic, Episcopal, Frankford, Howard, Jefferson, Jewish, Kensington, Lankenau, Medico-Chirurgical, Methodist, Misericordia, Mount Sinai, Northwestern, Oncologic, Orthopedic, Pennsylvania, Polyclinic, Presbyterian, Philadelphia General, Samaritan, Stetson, St. Agnes's, St. Christopher's, St. Luke's, St. Mary's, St. Joseph's, University, Wills Eye, Woman's, Women's College and Women's Homeopathic Hospitals.

General headquarters for the Congress will be at the Bellevue-Stratford Hotel where the entire first floor has been reserved for the use of the Congress. The large ballroom will be utilized for the evening sessions and for certain clinical demonstrations in the mornings and afternoons. The Clover, Red, Green, and other large rooms and foyers on the same floor will be utilized for registration and ticket bureaus, bulletin rooms.

The ninth annual convocation of the American College of Surgeons will be held in the ballroom on Friday evening at 8 o'clock at which time fellowship in the College will be conferred upon a large group of American and Canadian surgeons, and honorary fellowship upon the distinguished foreign guests.

The annual business meeting of the American College of Surgeons and the Clinical Congress will be held on Thursday afternoon.

An application for reduced railway fares is pending before the Trunk Line Association, and it is expected that the railways will grant a substantial reduction in fares for this meeting. Detailed information with regard to fares and traffic arrangements will be published in later issues.

A series of special clinical demonstrations of interest to general surgeons, presided over by Philadelphia surgeons and participated in by a

number of visiting surgeons, will be presented on Tuesday, Wednesday, and Friday afternoons at 2 o'clock in the ballroom of the Bellevue-Stratford. Similar clinical demonstrations dealing with surgery of the eye, ear, nose, throat and mouth will be given each forenoon.

LIMITED ATTENDANCE—ADVANCE REGISTRATION

Because of the popularity of these annual clinical meetings it has been found necessary in recent years to adopt the plan of limiting the attendance, requiring registration in advance on the part of those who wish to attend. A survey of the amphitheaters, lecture rooms, and laboratories in the several hospitals and medical schools, as to their capacity for accommodating visitors, will be made and the limit of attendance based thereon. This plan insures accommodations at the clinics for all who register in advance, and the necessity for adopting such a plan will be apparent to all. Based upon our experience at previous meetings, it is probable that the limit of attendance will be reached weeks in advance of the meeting, hence the necessity for early registration, for when the limit of attendance has been reached through advance registration, no further applications can be accepted. Attendance at all clinics, demonstrations, and scientific sessions will necessarily be restricted to those surgeons who have registered for the Congress.

CLINIC TICKETS

Attendance at all clinics and demonstrations is controlled by means of special clinic tickets, the number of tickets issued for any clinic or demonstration being limited to the capacity of the room in which the clinic or demonstration is to be given. As a general rule, one may secure two tickets for each day, one for a morning and one for an afternoon clinic, but for certain clinics, where the accommodations are limited and the demand for tickets is heavy, the rule will be that a visitor may have but one ticket for such clinic during the week. The use of these tickets has proven an efficient means of providing for the distribution of visitors among the several clinics and insures against overcrowding.

Clinic tickets will be issued at headquarters each morning at 8 o'clock for the clinics and demonstrations to be given that day, except that for Tuesday's clinics the tickets will be issued on Monday afternoon as the visiting surgeons register. A complete schedule of the day's clinics will be posted on bulletin boards at headquarters during the afternoon of the preceding day. After the program has been posted reservations for tickets for the next day's clinics may be filed, the tickets to be issued the next morning. Printed programs will be issued each morning containing the complete clinical program for the day, with announcements of the evening sessions, business meetings, etc.

REGISTRATION FEE

A registration fee of $5.00 is required of each surgeon attending the annual clinical meeting, the receipts from registration fees providing the funds with which to meet the expenses of conducting the meeting, so that no financial burden is imposed upon the members of the profession in the city entertaining the Congress.

A formal receipt for the registration fee is issued to each surgeon registering in advance, which receipt is to be exchanged for a general admission card at headquarters upon his arrival in Philadelphia. This card, which is non-transferable, must be presented to secure clinic tickets and admission to the evening meetings.

Headquarters at the Bellevue-Stratford Hotel will be open for registration on Monday, October 24. The clinical program for Tuesday will be bulletined at headquarters on Monday afternoon and tickets for Tuesday's clinics will be issued as visiting surgeons register.

STATE CLINICAL MEETINGS

MEETINGS of state sections of the Clinical Congress of the American College of Surgeons were held during May for the state of Indiana at Indianapolis, May 2 and 3; for Maryland and the District of Columbia, Baltimore, May 10, and Washington, May 11; for Massachusetts at Springfield, May 13 and 14. At each meeting there were clinical, scientific, and public sessions and a hospital conference on standardization. The programs follow:

INDIANA

MONDAY, MAY 2

Clinics

At the Indianapolis City, Methodist, and St. Vincent's Hospitals, 9 a.m. to 12 m.

Hospital Conference, 2:30 p.m.

Miles F. Porter, M.D., Chairman, Indiana State Section, presiding.

The Hospital Program of the American College of Surgeons and the Meaning of the Minimum Standard—Judge Harold M. Stephens, Director of Hospital Activities, American College of Surgeons.

The Work of the Hospital Surveyor—James L. Smith, M.D., Hospital Survey Department, American College of Surgeons.

Experience with the Standardization Program of the American College of Surgeons, from the Surgeon's Standpoint—Richard B. Wetherill, M.D., LaFayette.

Experience with the Standardization Program of the American College of Surgeons, from the Hospital Superintendent's Standpoint—H. L. Foreman, M.D., Superintendent, Indianapolis City Hospital.

Discussion—Opened by Miles F. Porter, M.D., Fort Wayne.

General Discussion.

Annual Meeting of the Indiana Section of the Clinical Congress of the American College of Surgeons.

Public Meeting, 8.00 p.m.

Miles F. Porter, M.D., Chairman, Indiana State Section, presiding.

Address of Welcome—Honorable Charles Jewett, Mayor of Indianapolis.

The American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.

The Surgeon and the Community—William D. Haggard, M.D., Professor of Surgery, Vanderbilt University, Nashville.

The Early Recognition of Cancer and Its Importance—Carl A. Hamann, Professor of Clinical Surgery, Western Reserve University, Cleveland.

What the Public Should Know about Cancer—Joseph C. Bloodgood, M.D., Associate Professor of Clinical Surgery, Johns Hopkins University, Baltimore.

The Standardization of Hospitals—Judge Harold M. Stephens, Director of Hospital Activities, American College of Surgeons.

TUESDAY, MAY 3

Clinics

At the Indianapolis City, Methodist, and St. Vincent's Hospitals, 9 a.m. to 12 m.

Scientific Session, 2:30 p.m.

Organization for Better Surgery—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.

Present Status of the Cancer Problem — William D. Haggard, M.D., Nashville.

Clinical Resemblance between Inflammatory Processes and Neoplasm—Carl A. Hamann, M.D., Cleveland.

MARYLAND AND DISTRICT OF COLUMBIA

TUESDAY, MAY 10, BALTIMORE

Clinics

At Johns Hopkins Hospital, 9 a.m. to 12 m. and University of Maryland Hospital, 1:30 to 4:30 p.m.

Scientific Session, 8:30 p.m.

Organization for Better Surgery—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.

The Relation of Disease of the Pelvic Organs in the Female to that of Other Abdominal Viscera—John B. Deaver, M.D., Philadelphia, President, American College of Surgeons.

Vesiculitis as a Focal Infection (illustrated by lantern slides)—J. H. Cunningham, M.D., Boston.

Spasmodic Porticollis—J. M. T. Finney, M.D., Baltimore

WEDNESDAY, MAY 11, WASHINGTON, D. C.

Clinics

At the Columbia, Emergency, Garfield, Providence, U. S. Naval, Walter Reed, and Episcopal Eye, Ear, and Throat Hospitals, 9 a.m. to 12:30 p.m.

Hospital Conference, 3 p.m.

J. Wesley Bovee, M.D., Chairman, District of Columbia Section, presiding.

The Hospital Program of the American College of Surgeons and the Meaning of the Minimum Standard—Judge Harold M. Stephens, Director of Hospital Activities, American College of Surgeons.

The Program of the American College of Surgeons as Applied to Catholic Hospitals—Reverend C. B. Moulinier, S. J., President, Catholic Hospital Association.

The Work of the Hospital Surveyor—James L. Smith, M.D., Hospital Survey Department, American College of Surgeons.

Experience with the Standardization Program of the American College of Surgeons, from the Surgeon's Standpoint—Colonel W. C. Borden, M.C., U.S.A., Washington.

Experience with the Standardization Program of the American College of Surgeons, from the Hospital Superintendent's Standpoint—Mr. J. R. Mays, Superintendent, Garfield Hospital, Washington.

Discussion—Opened by Colonel W. H. Arthur, M.C., U.S.A. (Retired), Washington.

Public Meeting, 8:15 p.m.

J. Wesley Bovee, M.D., Chairman, District of Columbia Section, presiding.
Address of Welcome—Honorable Henry B. F. Macfarland.
The American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
Scientific Research and Its Advantages to the Community John B. Deaver, M.D., Philadelphia, President, American College of Surgeons.
The American College of Surgeons and Its Relation to Public Welfare—Brigadier-General Charles E. Sawyer, M.C., U.S.A., Washington, Second Vice-President, American College of Surgeons.
Better Hospitals—Reverend C. B. Moulinier, S. J., President, Catholic Hospital Association.
The Standardization of Hospitals—Judge Harold M. Stephens, Director of Hospital Activities, American College of Surgeons.

MASSACHUSETTS

FRIDAY, MAY 13

Clinics

At the Mercy, Springfield, Wesson Memorial, and Wesson Maternity Hospitals, 10:30 a.m. to 12:30 p.m.

Hospital Conference, 2:30 p.m.

Hospital Standardization—Homer Gage, M.D., Worcester.
The Hospital Program of the American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
The Work of the Hospital Surveyor—James L. Smith, M.D., Hospital Survey Department, American College of Surgeons.
The Meaning of the Minimum Standard—Judge Harold M. Stephens, Director of Hospital Activities, American College of Surgeons.
The Program of the American College of Surgeons as Applied to Catholic Hospitals—Reverend C. B. Moulinier, S. J., President, Catholic Hospital Association.
Maternity Benefit Legislation—B. W. Paddock, M.D., Pittsfield.
Discussion—By Philemon E. Truesdale, M.D., Fall River, and Mr. W. C. Lyon, Superintendent, Springfield Hospital, Springfield.

Public Meeting, 8:15 p.m.

Introductory Address—William W. McClench, Esq.
The American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
Better Hospitals—Reverend C. B. Moulinier, S. J., President, Catholic Hospital Association.
The Standardization of Hospitals—Judge Harold M. Stephens, Director of Hospital Activities, American College of Surgeons.
Economic Value to the Community of Pre-Natal Work—John Osborn Polak, M.D., Brooklyn.

SATURDAY, MAY 14

Clinics

At the Mercy, Springfield, Wesson Maternity, and Wesson Memorial Hospitals, 9:30 a.m. to 12:30 p.m.

Scientific Session, 2:30 p.m.

The Relation of Animal Experimentation to Medical Progress—W. B. Cannon, M.D., Boston.
From the Inside, Looking Out—R. H. Seelye, M.D., Springfield.
Cancer—Joseph C. Bloodgood, M.D., Baltimore.
A Study of 307 Cases of Ectopic Pregnancies—John Osborn Polak, M.D., Brooklyn.

MEETINGS TO BE HELD

North Dakota—Bismarck, June 24 and 25.
South Dakota—Aberdeen, June 27 and 28.

CORRESPONDENCE

A NEW METHOD OF TYING A SURGICAL KNOT

To the Editor: In May, 1918, SURGERY, GYNECOLOGY AND OBSTETRICS published my paper entitled, "A New Method of Tying a Surgical Knot."

In that article I said: "The credit of the idea of using forceps instead of fingers should be given, I believe, to Dr. A. L. Soresi, of New York, now serving with great distinction in the Italian army. Dr. Soresi published an article several years ago describing a method of making a knot when the suture had been broken off. Surgeons use forceps in certain cases, but I find nothing in the literature describing this method and its universal application."

My attention has been called to the fact that Dr. Soresi's paper referred to was published in the *American Journal of Surgery*, for March, 1911, and was entitled "A Means of Tying Knots Even When One End of the Suture is Very Short."

The credit of the idea should, therefore, be given Dr. Soresi.

My method of procedure and its universal application to all varieties of knots and ligatures furnishes a technique that is practicable to right-handed surgeons.

A. R. GRANT.
UTICA, N. Y.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

KEEN'S SURGERY: ITS PRINCIPLES AND PRACTICE. By various authors. Edited by William Williams Keen, M.D., LL.D. Vol. viii and index. Philadelphia and London: W. B. Saunders Co., 1921.

UEBER DIE ENTWICKLUNG UND DEN AUSBAU DER SUPRASYMPHYSAEREN SCHNITTENTBINDUNG AN DER UNIVERSITAETS-FRAUENKLINIK TUEBINGEN. By Dr. Emil Vogt. Berlin: S. Karger, 1921.

DIE THERAPIE DER PLACENTA PRÆVIA. By Professor Dr. F. Hitschmann. Berlin: S. Karger, 1921.

TREATISE ON FRACTURES IN GENERAL, INDUSTRIAL, AND MILITARY PRACTICE. By John B. Roberts, A.M., M.D., F.A.C.S., and James A. Kelly, A.M., M.D. Philadelphia and London: J. B. Lippincott Co., 1921.

ANNUAL REPRINT OF THE REPORTS OF THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION, FOR 1920.

PSYCHOPATHOLOGY. By Edward J. Kempf, M.D. St. Louis: C. V. Mosby Company, 1920.

THE PRACTICAL MEDICINE SERIES. Vol. ii. Edited by Albert J. Ochsner, M.D., F.R.M.S., LL.D., F.A.C.S. Chicago: The Year Book Publishers, 1920.

OPERATIVE SURGERY; FOR STUDENTS AND PRACTITIONERS. By John J. McGrath, M.D., F.A.C.S., 6th ed. revised. Philadelphia: F. A. Davis Company, 1921.